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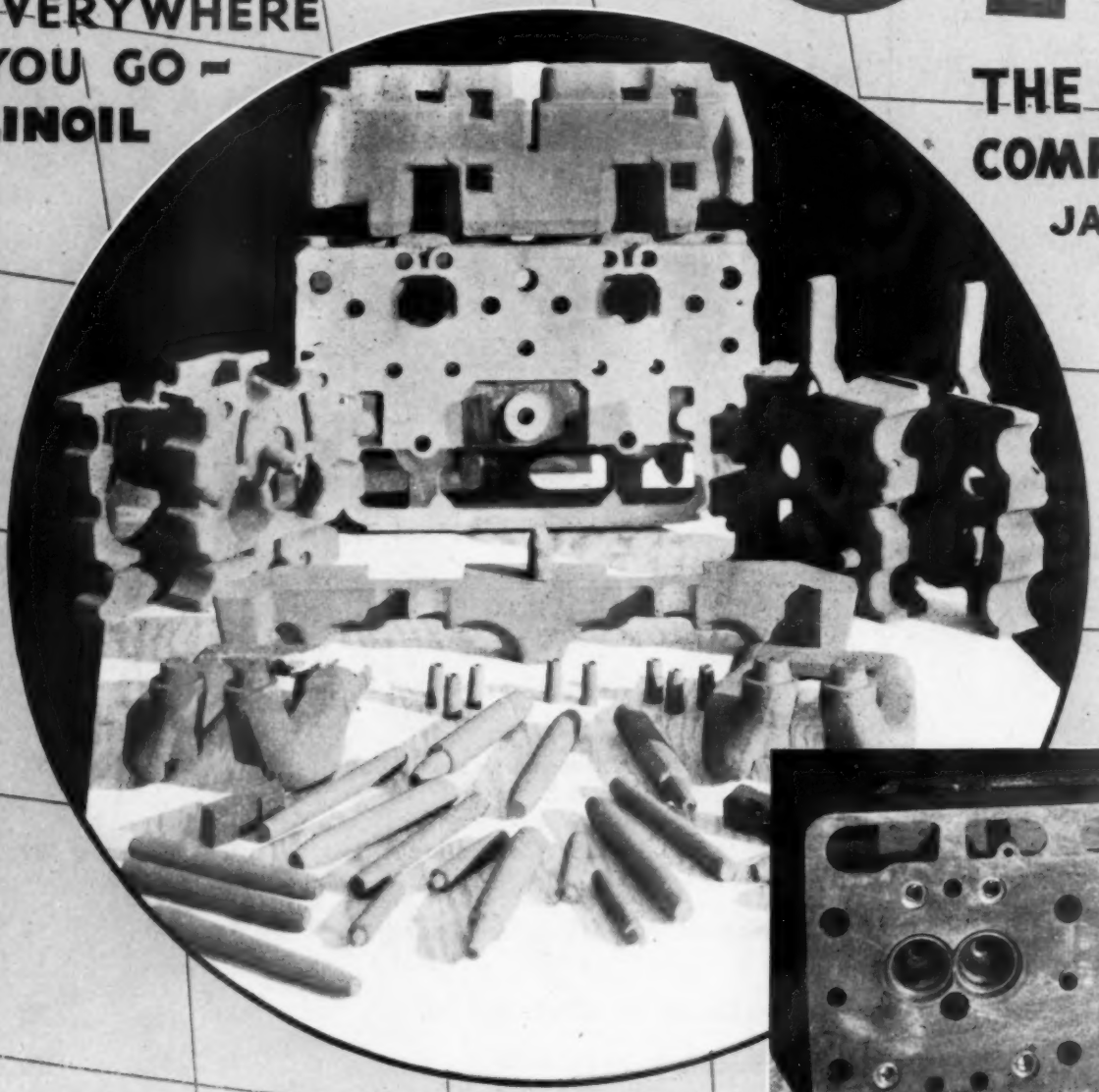
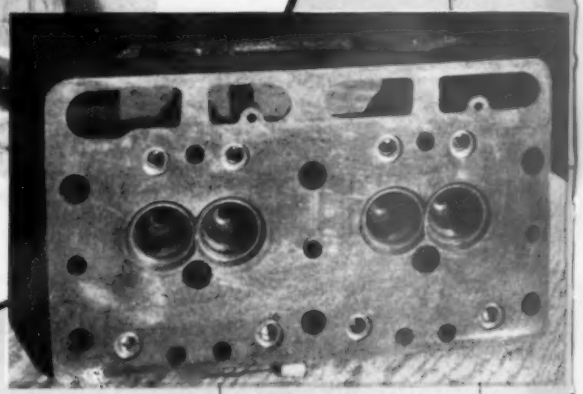
JACKSONVILLE FLORIDA





If there is any one thing more than anything else that makes Linoil popular with hard-driven foundrymen the nation over it is Linoil's absolute uniformity. Nothing is more important. But, Linoil has everything else it takes to make a good core oil. It has superior binding strength which means less oil in each core. Linoil is a small gas producer and that means fewer blown castings. Linoil collapses by time the metal has set and that means fewer contraction fractures, and it also means really fast work in the cleaning department. Core oil may be only one of the foundryman's problems, but it is an important one directly affecting profits and deliveries. Linoil solves many problems.

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Vocational Schools Need Helping Hand

FOR many years various organizations in the foundry industry have given considerable attention to problems of foundry education in engineering schools. Active interest has been shown by such groups as the Malleable Founders' Society, the Gray Iron Founders' Society, the Steel Founders' Society of America, and the A.F.A. Committee on Co-operation with Engineering Schools. Among other things, these organizations have supplied handbooks and other data on castings, sponsored research projects on both castings and methods of production, and furthered instructional courses in foundry practice for engineering students.

These efforts have proved valuable in making engineering graduates more conscious of the basic nature of castings in all engineering construction. The activity also has caused a larger number of young engineers to enter the foundry field. Based on results already achieved and the knowledge that greater mechanization of practices in the postwar period will require more foundry engineers, it seems plain that the various groups should accelerate their work among the colleges.

Although more numerous, foundry training courses in high schools and trade schools generally have not been given the same organized support. Frequently producers of castings and manufacturers of equipment and supplies have assisted materially in equipping individual foundry practice laboratories, especially in connection with the trade schools located in the larger industrial centers. When times were good and the labor supply scarce, foundries were quick to hire boys from these schools who have had some degree of training in certain fundamentals of foundry practice. But with few exceptions the support of the industry has not been a year in, year out affair designed to help vocational arts teachers of patternshop and foundry practice attract an ample supply of intelligent boys who have been given some insight in the romance of the casting of metals. Too many times the support has not been sufficient to insure jobs for the graduates of the trade schools in hard times as well as in good.

Today the problems of foundry and patternshop teachers have been increased greatly. By the time most boys are ready to enroll in such courses they have joined the Army or Navy and are off to the wars. Enrollments have shrunk to the point where some classes have been discontinued and others are threatened. Whether or not foundry and patternshop courses will be re-established in many vocational and high schools after the war depends greatly on foundrymen.

School boards usually are sensitive to the needs of the community. If a school in your locality has a foundry course, get other foundrymen in the vicinity to join with you in an effort to help keep the foundry classes in operation or to get them started again after the war. The present situation offers a distinct challenge to individual foundrymen, chapters, and local associations.

Frank G. Steinebach
Editor

Veterans Learn to Make Precision Castings

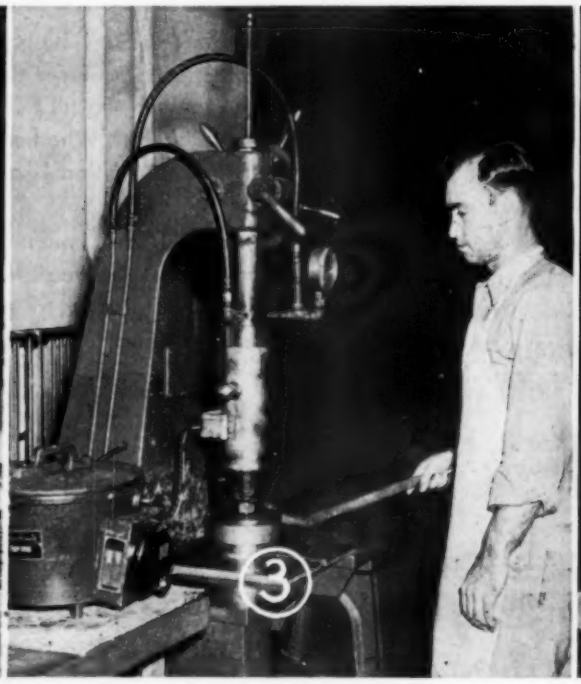
THE precision casting process is being employed by the Ford Motor Co. at Dearborn, Mich., in producing a wide variety of high-speed cutting tools and other castings. Using methods developed by Ford technicians, operations are carried on in a small pilot plant at Camp Legion—Henry Ford's rehabilitation camp for handicapped veterans of World War II.

While the Camp Legion plant is not a regular production shop in which emphasis is placed on volume of output, the castings made there in sizeable number find ready use in the machine shops of other Ford plants. These castings, as indicated in Fig. 1, include side mill cutters, keyway cutters, end mills, spot facers and other tools. Primary purpose of the Camp Legion plant, however, is to enable handicapped veterans to learn a useful trade that will enable them to earn a respectable living by doing a useful job. Precision casting is only one of the trades taught; in addition, if they so desire, the veterans learn woodworking, farming, auto repair work, tool designing, mechanical drafting, forestry, work with plastics and a variety of other subjects.

Any disabled veteran with a medical discharge from one of the armed services or the Merchant Marine is eligible for admission. While at Camp Legion he receives free board and room and is paid $3 a day while he learns both in the class room and by actually doing the job. There are no strings attached. He can stay as long as he likes, work as much or as little as he pleases, and is not obligated (*Please turn to page* 206)

Fig. 2—Veteran holds conventional metal mold containing six wax patterns. Plastic mold at right, designed by Ford technicians, possesses dual advantages of light weight and removable inserts. When one insert is damaged it is not necessary to scrap the entire mold

Fig. 3—Operating a wax injection machine which forces melted wax under 90-pounds pressure into the pattern mold. Fig. 4—Mounting wax patterns for precision castings on a wax base preparatory to surrounding them with investment material



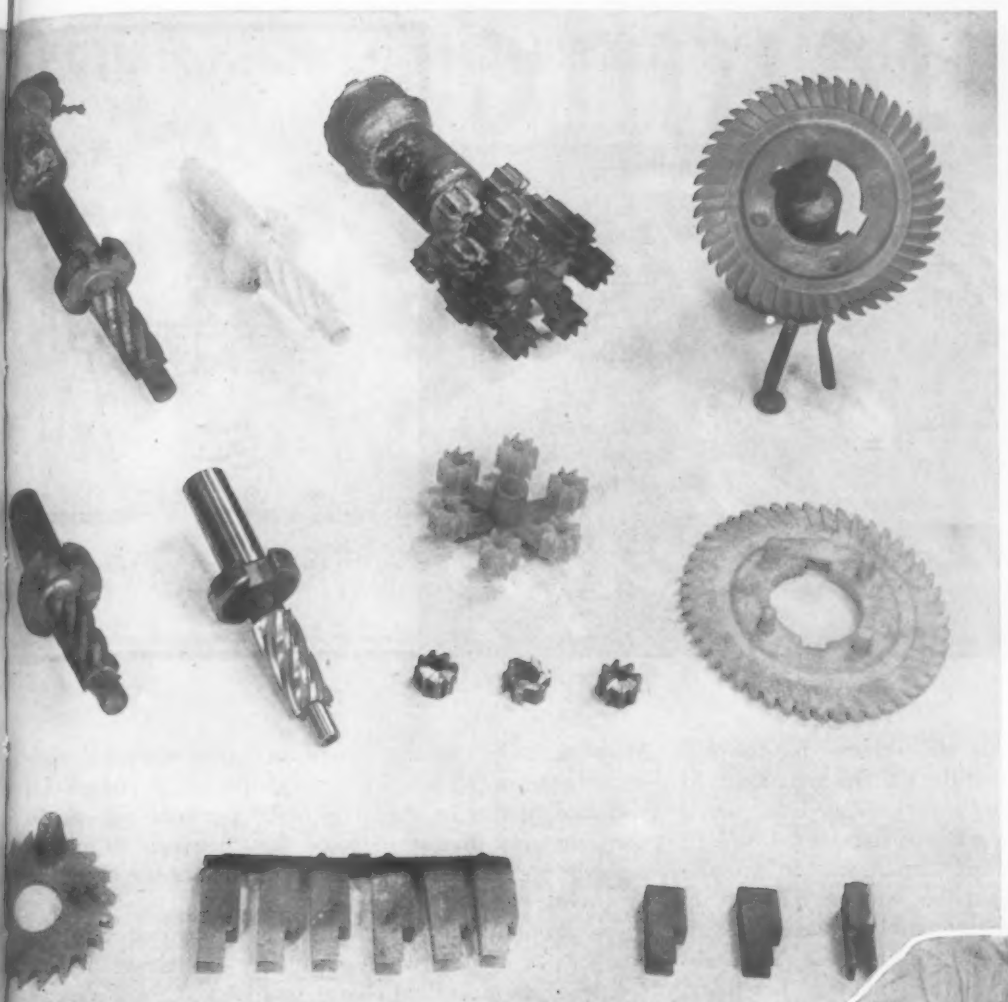


Fig. 1 — Patterns and precision castings made at Henry Ford's Camp Legion plant. Top row, left to right: Side mill cutter, rough casting of end mill; end mill wax pattern; cluster of spot facers; milling machine cutter

Middle row: Wax pattern of side mill cutter; end mill ready for finish grinding; end mill ready for use; cluster of wax patterns for spot facers with three finish ground facers directly below; wax pattern for milling machine cutter

Bottom row: Key way cutter; key way cutter wax pattern; six steady rest pattern inserts; three steady rest precision castings

Fig. 5 — Pouring precision casting from a Ford-designed electrode furnace.

WEIGHING Cupola Fuel and Metal Charges

CUPOLA charge materials are weighed for the following reasons: 1. So that the various ingredients in the charge are sufficiently proportioned to permit the cupola melting process to produce the desired type of iron; 2. To enable the melting department to provide enough metal to pour off all molds without melting too much iron; 3. To furnish the accounting department with accurate records of raw materials consumed; 4. To establish factual data on metallic losses in melting, hot metal handling and cleaning operations; 5. To keep the weight of charges for the various sizes of cupolas within the cupola's ability to perform; 6. To keep fuel and metal uniformly proportioned from one charge to another and from one day to another or between one charging gang and another; 7. To enable the skilled melter and founder progressively to improve foundry procedures, both in the melting department and in the quality of the product produced.

Most foundries assume cupola melting losses to be 3 per cent, but this is a composite figure intended to cover all metallics unaccounted for between the true weights of raw materials received and the true weights of products shipped plus the true weight of revert material. There can be discrepancies in the weights of incoming materials due to rust or other contaminants, and actual metallic losses in melting, through the slag hole, in spillage while handling and pouring molten metal and in grinding or other operations in the finishing department. It is essential to know the sum total of these sources of metallic losses so that proper provision may be made in cost accounting, but it is also essential to hold each source of metallic loss to a minimum.

True melting losses are considerably under 5 per cent while total loss of metallics from all sources may be considerably higher than 5 per cent. Most foundries account for discrepancies in inventory of raw materials by annual or semi-annual adjustments. A portion of these discrepancies not accounted for are associated with metallic losses.

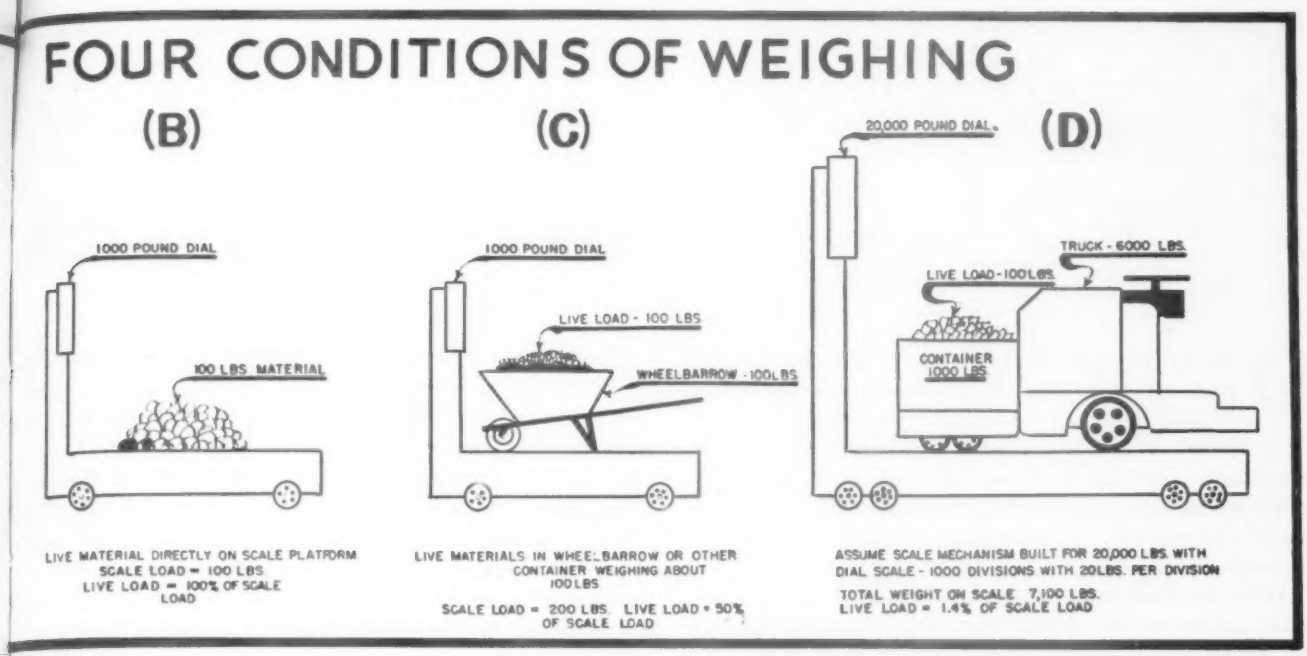
In bygone days the cupola metal charge contained two components or ingredients, pig and gray iron scrap. Metallurgically speaking, there is a great chemical similarity between pig iron and gray iron scrap. A charge that was intended to be made up of 50 per cent pig and 50 per cent gray iron scrap could vary between 40 and 60 per cent pig iron without undue variation in the chemistry or quality of iron produced.

In addition to a metallic charge containing only two components which were chemically quite similar, the weight of an individual charge was large. Cupola charges usually ranged between 1 and 6 tons, for various size cupolas, and were usually in rounded figures of 4000, 5000, 6000, 7000, etc., pounds. In effect we have just said that with a charge containing 50 per cent pig and 50 per cent gray iron scrap, the pig iron ingredient might actually weigh as little as 1600 pounds or as much as 2400 pounds (4000-pound total charge) with scrap varying from 2400 to 1600 pounds and still produce an iron of approximately equivalent chemistry and quality. It should be noted that the intended weight of the pig iron ingredient was 2000 pounds, that the percentage deviation from 2000 pounds was 20 per cent and also that the weight-deviation was 400 pounds.

Cupola Charges Are Smaller

In modern cupola melting of quality gray iron, the cupola charge frequently contains four or more ingredients (up to 10 or more) and there is most likely to be great chemical dissimilarity between one ingredient and another. It is quite possible that one ingredient in the metal charge will be steel scrap while some other ingredient may be silvery pig iron of 10 per cent silicon or spiegeleisen with 20 per cent manganese. In addition to great chemical dissimilarity between ingredients in one metal charge, the total weight of the charge is likely to be much smaller than it was some years ago. Some years ago it was not unusual to use a 4000-pound metal charge and as much as 500 pounds of coke in a cupola limited to 48 inches. In recent years the same size cupola has operated with charges as small as 800 pounds of metal and 65 pounds of coke.

In the old charge of 4000 pounds containing 1600 to


FOUR CONDITIONS OF WEIGHING
(B)
(C)
(D)
1000 POUND DIAL
100 LBS. MATERIAL
LIVE MATERIAL DIRECTLY ON SCALE PLATFORM
SCALE LOAD = 100 LBS.
LIVE LOAD = 100% OF SCALE LOAD
1000 POUND DIAL
LIVE LOAD - 100 LBS
WHEELBARROW - 100 LBS
LIVE MATERIALS IN WHEELBARROW OR OTHER CONTAINER WEIGHING ABOUT 100 LBS
SCALE LOAD = 200 LBS. LIVE LOAD = 50% OF SCALE LOAD
20,000 POUND DIAL
TRUCK - 6000 LBS.
LIVE LOAD - 100 LBS
CONTAINER 1000 LBS
ASSUME SCALE MECHANISM BUILT FOR 20,000 LBS WITH DIAL SCALE - 1000 DIVISIONS WITH 20 LBS. PER DIVISION
TOTAL WEIGHT ON SCALE 7,100 LBS.
LIVE LOAD = 1.4% OF SCALE LOAD

By DONALD J. REESE
Consultant on Foundry Facilities
Steel Division
War Production Board

2400 pounds of pig iron and the balance scrap, we experienced weight deviations of 20 per cent or 400 pounds. Now our total charge might be only 800 pounds and this total charge is made up of at least four ingredients. For simplicity in illustration we might assume that the various ingredients include 30 per cent steel scrap, 10 per cent silvery pig iron, 30 per cent automotive and 30 per cent foundry revert. The 800-pound charge is made up of ingredients weighing 240, 80, 240 and 240 pounds, respectively. The total weight of any one ingredient in this charge is less than the permissible variation of 400 pounds in weighing 2000 pounds of pig in the 50 per cent pig—50 per cent gray iron scrap charge of years ago. One ingredient in this metal charge weighs only 80 pounds which in the illustration is silvery pig iron containing 10 per cent silicon. It is easily seen that any failure to weigh this ingredient accurately would result in wide variations in the silicon chemistry of the cupola product.

Steel scrap is used in the cupola charge for numbers of reasons that relate to the carbon and phosphorous chemistry and temperature of the cupola product, but the more important reason is concerned with the carbon chemistry of the cupola product, and when a cupola is properly operated variations in the weight of the steel scrap ingredient of the metal charge result in carbon variations in the cupola product.

Of course, there are other potent factors that influence the carbon content of the cupola product such as (1) carbon content of the steel scrap, (2) chemistry of the iron to be produced, (3) characteristic of the particular coke, (4) proportion of fuel to metal, (5) thermal conditions in the cupola, (6) method of tapping metal from the cupola, etc., but recognizing that all these factors are important, we also recognize the important factor involved in weighing the various component parts of the charge.

In former days the carbon content of the cupola product deviated little from 3.5 per cent, except for high phosphorous irons, etc. and the function of coke in the cupola process was limited to the generation of heat. With the introduction of steel scrap in the cupola melting process, carbon content of the charge was depressed in proportion to the per cent of steel used. With carbon and molten iron in intimate contact at high temperature, iron becomes saturated with carbon in proportion to temperature and time of exposure. That is, the cupola is a carburizing melting process and to some great or small degree offsets the regulation of the carbon content of the charge affected by the use of steel scrap.

Carbon Varies Over Wide Range

With full freedom in selecting the ingredients in the cupola charge, the carbon content of the charge may be established anywhere between 3.5 and 0.25 per cent but the carbon content of the cupola product does not follow this pattern, for even though the charge contains as little as 0.25 per cent carbon, the product may contain anywhere from 2.0 to 3.6 per cent carbon. In this extreme case, used for illustrative purposes, the minimum carbon increase would be from 0.25 in the charge to 2.0 in the product or 1.75 per cent, while the maximum would be 3.35 per cent. Translating these figures into their relation to iron and coke, it would mean 35 to 67 pounds of carbon per ton of iron or, with coke that is 90 per cent carbon, it would mean from 39 to 74 pounds of coke per ton of iron.

We might be ready to agree now that coke in modern cupola practice not only serves as a heat generating medium but that a portion of it is used in the carburizing process, and if we wish to achieve finesse in controlling carbons in the cupola process within the permissible limits of this process, the coke should be weighed accurately.

It was pointed out earlier that the coke charge of a cupola lined to 48 inches has been as much as 500 pounds and as little as 65 pounds and that the function of coke with the 500-pound charge was (*Please turn to page* 190)

Establishing a Sales Policy FOR JOBBING F

By ALBERT E. GROVER

DURING the present conflict, management has been primarily interested in producing the implements of war which are so necessary to an early cessation of hostilities, and there has been a tendency among manufacturers, including producers of castings, to accept the collective planning necessitated by the war, and guarantee of cost recovery, as justification for a general letdown in cost control.

However, these conditions do not relieve management from recognizing the importance of studying present costing procedures to ascertain if changes should be made to control postwar costs for use as a basis for establishing a dependable sales policy for each item of production.

Whether or not price ceilings are continued after the war, there will surely be no restriction placed on foundries who may bid for business at prices below any established ceiling. Therefore, the wise foundryman will see to it that he enters competition with a scientifically prepared basis for the establishment of a sales policy for each casting to be produced, so as to put him in a position to select the work that is most profitable.

The wide-awake foundryman will make only such castings as his foundry is equipped to produce efficiently, and will establish effective controls over waste in manpower, product, and the use of fixed and perishable assets.

Analyze Casting Costs

As a matter of fact, the very existence of any foundry during the period following the close of the war may well depend upon how much intelligent effort it has put into analyzing the costs of the various castings it will make.

In many foundries more effective cost procedures will have to be inaugurated, and this must be done even if it takes more clerks to do the job.

After the war, some foundries will still be in possession of buildings and equipment which were used in producing for war. Some of these operating facilities may be the property of the government, while others may be owned by the company.

Whichever condition prevails, the executives of the company entrusted with the management of its affairs should protect the interest of the stockholders by seeing that a dependable basis for establishing sales policies is established. This can be done only if every element of cost necessary to use these facilities is analyzed and the proper costs established.

The following basic activities are necessary in every foundry: 1. Executive administration; 2. Selling; 3. Producing; 4. Accounting.

The establishment of costs for each of these activities requires: 1. The use of certain basic cost principles; 2. The exercise of common sense; 3. A thorough knowledge of production technique peculiar to foundry operations.

The executive personnel of a foundry usually consists of: 1. President; 2. Vice president; 3. Treasurer; 4. General manager; 5. Secretary; 6. Controller who is responsible for the planning and conduct of systems for accumulating, recording, and reporting the costs of the various activities of the business.

The cost of each type of executive administration consists of: 1. Salary of the chief executive; 2. Salary of assistants to the chief executive; 3. Salary of other personnel attached to the chief executive and his assistants' activities; 4. Traveling expenses incident thereto; 5. Cost of maintaining office facilities.

Case No. 1—Competitive Selling Price at Approximate Ceiling

		Concession	Recovery
Weight in mold. lbs.	30.000		
Gates and sprues	10.000		
Good castings	20,000		
Metal Cost—30.000 lbs. @ $1.20 per hundred			$360.00
Less—gates and sprues remelted 10.000 lbs. @ $1.00 per hundred			100.00
Metal cost in good castings			$260.00
Melting Cost			
Labor		$36.00	
Overhead			
Variable		38.00	
Fixed		6.00	80.00
Core Making Cost			
Material		30.00	
Labor—100 hours @ $.90 per hour		90.00	
Overhead			
Variable		90.00	
Fixed		60.00	270.00
Molding Cost			
Labor—200 hours @ $1.25 per hour		250.00	
Overhead			
Variable		240.00	
Fixed		100.00	590.00
Cleaning Cost			
Labor—40 hours @ $.80 per hour		32.00	
Overhead			
Variable		25.00	
Fixed		8.00	65.00
TOTAL			$1,265.00
Returns—1 200 lbs. @ $.066 per lb.		$79.20	
Less—remelt value @ .011 per lb.		13.20	66.00
Selling Cost—5% of $1,107.00 Producing Cost			55.35
Executive Administrative Cost, 4% of $1,107.00 Producing Cost			44.28
Total Cost			$1,430.63
Profit (Based on invested capital for this job)			
5% for normal interest			72.33
5% p ovision for stockholder's risk			72.33
Total estimated profit			$ 144.66
Extra marketing profit			$ 124.71
Selling Price			
Estimated			$1,575.29
Established ceiling			1,700.00
Competitive price			1,700.00
Quoted			1,700.00

FOUNDRIES

Some companies operate as a single manufacturing unit, while others are made up of several separate units controlled by the same administrative personnel.

Companies operating as a single manufacturing unit can accomplish satisfactory results by combining all the several administration activities into one figure. However, if the cost of operating each administrative activity is desired, then the several elements of cost must be measured accordingly.

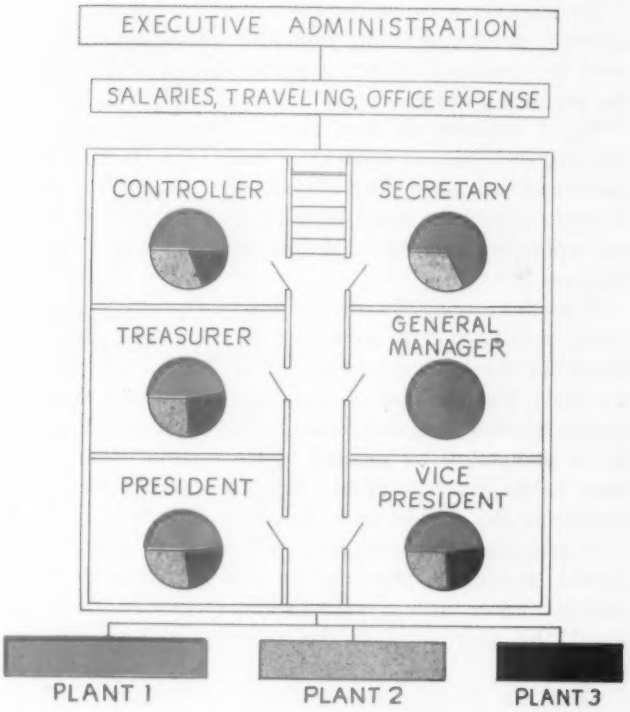


Fig. 1 (right)—Floor plan of executive administration offices, showing portions of cost of each executive activity applicable to different manufacturing units

Individual Job Cost Estimates

Case No. 2—Competitive Selling Price Under Ceiling

		Concession	Recovery
Weight in Mold, lbs.	30,000		
Gates and sprues	10,000		
Metal Cost—30,000 lbs. @ $1.20 per hundred			
Less—gates and sprues remelted 10,000 lbs. @ $1.00 per hundred			
Metal cost in good castings			$260.00
Melting Cost			
Labor			36.00
Overhead			
Variable			38.00
Fixed			6.00
Core Making Cost			
Material			30.00
Labor—100 hours @ $.90 per hour			90.00
Overhead			
Variable			90.00
Fixed			60.00
Molding Cost			
Labor—200 hours @ $1.25 per hour			250.00
Overhead			
Variable			240.00
Fixed		$23.00	77.00
Cleaning Cost			
Labor—40 hours @ $.80 per hour			32.00
Overhead			
Variable			25.00
Fixed		8.00	
Total			
Returns—1 200 lbs. @ $.066 per lb.			
Less—remelt value @ $.011 per lb			66.00
Selling Cost 5% of $1,107.00 Producing Cost		55.35	
Executive Administrative Cost, 4% of $1,107.00 Producing Cost		44.28	
Total Cost		$130.63	$1,300.00
Profit (Based on invested capital for this job)			
5% for normal interest		72.33	
5% provision for stockholder's risk		72.33	
Total estimated profit			
Extra marketing profit			
Selling Price			
Estimated		$275.29	
Established ceiling			1,700.00
Competitive price			1,300.00
Quoted			

Case No. 3—Keen Competition—Hungry for Business

		Concession	Recovery
Weight in mold, lbs.	30,000		
Gates and sprues	10,000		
Good castings	20,000		
Metal Cost—30,000 lbs. @ $1.20 per hundred			
Less—gates and sprues remelted 10,000 lbs. @ $1.00 per hundred			
Metal cost in good castings			$260.00
Melting Cost			
Labor			36.00
Overhead			
Variable			38.00
Fixed		$6.00	
Core Making Cost			
Material			30.00
Labor—100 hours @ $.90 per hour			90.00
Overhead			
Variable			90.00
Fixed		60.00	
Molding Cost			
Labor—200 hours @ $1.25 per hour			250.00
Overhead			
Variable		66.00	174.00
Fixed		100.00	
Cleaning Cost			
Labor—40 hours @ $.80 per hour			32.00
Overhead			
Variable		25.00	
Fixed		8.00	
Total			
Returns—1,200 lbs. @ $.066 per lb.			
Less—remelt value @ $.011 per lb.		66.00	
Selling Cost—5% of $1,107.00 Producing Cost		55.35	
Executive Administrative Cost, 4% of $1,107.00 Producing Cost		44.28	
Total Cost		$430.63	$1,000.00
Profit (Based on invested capital for this job)			
5% for normal interest		72.33	
5% provision for stockholder's risk		72.33	
Total estimated profit			
Extra marketing profit			
Selling Price			
Estimated		$575.29	
Established ceiling			
Competitive price			1,000.00
Quoted			

To properly account for the operating results of each separate producing unit, executive administrative costs must be measured. Then a portion allocated to each of the producing units.

Fig. 1 illustrates a floor plan of executive administration offices. Various sections of each circle represent the portion of the cost of the particular executive activity which is applicable to the manufacturing unit represented by the corresponding rectangles shown on the bottom of the diagram.

There is no scientific rule, known to the author, for allocating administrative costs, either separately or collectively, to the several plants. However, it is still quite necessary that the cost of each administrative activity be measured, and then have the executive arbitrarily establish a percentage to be used in the distribution of these costs to the separate plants. Fig. 2 shows a method of measuring the cost of each executive activity.

In preparing this schedule, each separate cost element should, insofar as possible, be charged directly to the activity. Only those elements which cannot be so charged should be distributed to the several activities on some other basis.

Costs not charged direct must be distributed on bases most nearly representing the usage, such as floor area, value of office furniture and fixtures, salaries, number of employees.

The results of accumulating both direct and distributed charges for each Executive Administrative activity are entered in their respective columns. The total of each element is then added crosswise and the sum entered in the "Total" column. Each column is then added. The sum thus obtained is entered as "Total Administrative Costs." The total cost of each activity is then allocated to each plant on the percentage arbitrarily established by the chief executive of the activity.

The distributed amounts for each plant are added, entering the sums of each in the "Total" column. These totals are then used to determine a percentage basis for charging executive administrative costs to separate jobs in a particular plant. (See the method illustrated for Plant No. 1 at the bottom of Fig. 2).

The objective of every manufacturing enterprise, whether it be a foundry or other type of production, is the return of money or other valuable assets as a result of using funds invested in manufacturing facilities. These facilities are made up of buildings, equipment and personnel, together with money tied up in inventories, customers' accounts and sufficient cash to meet the current obligations of the company to pay for materials, labor and other operating expenses.

The measure of these investments should be the first consideration in establishing a postwar sales policy. The measure of the value of the fixed assets should be based, of course, on the best postwar replacements values obtainable. An illustration of this principle is shown in Fig. 3.

The next consideration should be the determination of a suitable return on the investment. This should provide for: 1. Interest on invested capital—money paid for the use of money; 2. Operating profit—money paid for the hazards involved in the investment of money in a business enterprise. (*Please turn to page* 214)

Fig. 2 (left)—Showing a method of measuring cost of each executive activity. Fig. 3 (right)—Balancing scheduled production with productive capacity

EMPLOYMENT OF EXECUTIVE ADMINISTRATIVE COSTS	PRESIDENT	VICE PRESIDENT	TREASURER	GENERAL MAN'GR.	SECRETARY	CONTROLLER	TOTAL
SALARIES							
TRAVELING EXPENSE							
OFFICE EXPENSES							
BUILDINGS							
Depreciation							
Property Taxes							
Property Insurance							
Maintenance							
Heat							
Light							
OFFICE FURN. and FIXT.							
Depreciation							
Property Taxes							
Property Insurance							
Maintenance							
GENERAL							
Supplies							
Employee Taxes							
Employee Insurance							
Telephone-Telegraph							
Professional Services							
Association Dues							
Donations							
Miscellaneous							
TOTAL ADMIN. COSTS							
DISTRIBUTED TO:	% Amt.	% Amt.	% Amt.	% Amt.	% Amt.	% Amt.	
Plant No. 1	48	48	46	100	60	50	0
Plant No. 2	30	30	32		40	32	
Plant No. 3	22	22	22			18	

RATE ESTABLISHMENT

Executive Admin. Cost-$18,000 / Producing Cost - $450,000 = 4.0%

FIXED ASSETS	INVESTMENT	
Land	$ 3,000	
Buildings	175,000	
Equipment	500,000	$ 678,000
CURRENT ASSETS		
Inventory	$ 175,000	
Accounts Receivable	100,000	
Cash	75,000	$ 350,000
TOTAL INVESTMENT		$ 1,028,000

	NORMAL PROFIT ONE YEAR		ONE MONTH	
Investment @ 5%	$51,400		$4,283	
Operating @ 5%	51,400	$102,800	4,283	$8,566

SCHEDULED PRODUCTION

PRODUCT Class	Pattern No.	CASTINGS	SALES PRICE Each	SALES PRICE Amount	STANDARD COST Each	STANDARD COST Amount	MANUFACTURING PROFIT
A	C1487	10M	$2.00	$20,000	$1.87	$18,750	$ 1,250
	14676	5M	1.75	8,750	1.52	7,625	1,125
	X-180C	8M	2.50	20,000	2.25	18,000	2,000
B	8C-10Y	15M	2.04	30,500	1.25	25,000	5,500
	1064C	3,400	4.50	15,300	3.65	12,475	2,825
				$94,550		$81,850	$12,700

LESS:		
SELLING COST	$5,800	
ADMINISTRATIVE EXPENSES	$3,600	$ 9,400
		$ 3,300

Progress in Malleable Iron Melting in the United States

By A. J. GRINDLE
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AT THE end of World War I about 90 per cent of all malleable iron was melted in the United States with bituminous coal in hand-fired reverberatory furnaces commonly known as air furnaces, about 8 per cent was melted in cupolas and about 2 per cent in open-hearth furnaces.

Due to improvements made in melting equipment and firing methods since 1918, only 2.7 per cent of all malleable is now melted in hand-fired furnaces. Table I indicates the changes that have taken place during the past 26 years.

The industry has almost entirely eliminated the laborious and variable hand firing methods by using automatically fired melting units.

The trend during the past 7 years is toward continuous melting; 56.2 per cent of the malleable tonnage today is melted continuously. During the past 2 years malleable iron has become recognized as a very necessary metal for war equipment and became one of the bottlenecks in the war program. To relieve this condition 14 of the malleable foundries have installed duplexing equipment and with the same or less labor have increased production of vitally needed castings.

A continuous supply of molten iron makes mold conveyors, sand handling equipment and other labor saving devices practical for the malleable iron foundry, whereas they would be largely ineffective without continuous melting.

The four grades of malleable iron now produced by one or more of the various processes are shown in Table II.

The grades or mechanical properties of malleable iron are dependent upon analysis, temperature of the molten iron, cooling rate in mold, annealing time and temperature and other heat treatment.

Out of a total of 110 malleable iron foundries in the United States 28 are cupola-air furnace duplexing; 2 are cupola-electric furnace duplexing; 1 cupola-open hearth duplexing and 8 melting continuously in cupolas without holding furnaces (for fittings) or a total of 39 plants now melting continuously.

Grade 35018—"A" malleable is being consistently produced by the cupola-air furnace duplexing process, and this grade of iron can be produced by any malleable foundry with this method if reasonable attention is paid to weighing of metal and coke, grade of coke, proper distribution of the charge, air control, slagging, correct size of holding furnace hearth and proper application and adjustment of the flame. In cupola-electric duplexing the low carbon content required for grade "A" iron can be obtained by adding sufficient hot or cold steel to the cupola iron in the electric furnace.

With the best cupola opera- (*Please turn to page* 196)

TABLE I—Melting Methods and Fuels Utilized

Melting Method	Annual Melting Capacity (tons)	Per Cent Of Total
Cupola to pulverized coal fired air furnace	839,750	35.1
Cupola to oil fired air furnace	26,700	1.1
Cupola to electric furnace	288,000	12.0
Cupola to oil fired open hearth	37,500	1.6
Cupola (no holding furnace)	153,250	6.4
Total continuous melting	1,345,200	56.2
Air furnace pulverized coal fired	936,980	39.2
Air furnace oil fired	29,500	1.2
Air furnace hand fired coal	65,400	2.7
Electric furnace	8,250	.3
Rotary furnace pulverized coal fired	10,000	.4
Total batch melting	1,050,130	43.8
Total melting capacity	2,395,330	100.0
Fuels Utilized		
Pulverized coal	1,786,730	74.7
Oil	93,700	3.8
Gas	.....	...
Electricity	296,250	12.4
Coke—cupola (not including 1,191,950 tons used in duplexing)	153,250	6.4
Coal—hand fired	65,400	2.7
Coal—stoker	.....	...
Total capacity	2,395,330	100.0

TABLE II—Grades of Malleable Iron Produced

Grade	Minimum Ultimate, psi	Minimum Yield, psi	Elongation %	Analysis of Hard Iron Carbon	Silicon
Cupola	40,000	30,000	5	2.80-3.10	0.70-1.10
32510"B"	50,000	32,500	10	2.25-2.70	0.80-1.40
35018"A"	53,000	35,000	18	1.75-2.35	0.85-1.20
Special	60,000	40,000	5	Special	

TABLE III—Analysis Changes in Duplexing

	Total Carbon	Silicon	Manganese	Sulphur
Cupola charge	1.95	1.50	.53	.08
Cupola changes	+ .70	— .25	—.11	+.03
Cupola metal to furnace	2.65	1.25	.44	.11
Air furnace changes	— .30	— .10	—.044	+.01
Final analysis	2.35	1.15	.396	.12

By VICTOR E. ZANG
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Scrap Melting SAVES ALLOYS

IN OCTOBER, 1943, the author as a member of the Ferrous Foundry Advisory Committee presented a report, "Conservation of Alloys," to the War Production Board which was based on an experimental melting program, devised and perfected by the metallurgical department of the Unitcast Corp. for the conservation of alloys by use of available alloy scrap to produce three-way alloy steel. That report was presented in the March, 1944 issue of THE FOUNDRY and entitled "Utilize Alloy Steel Scrap."

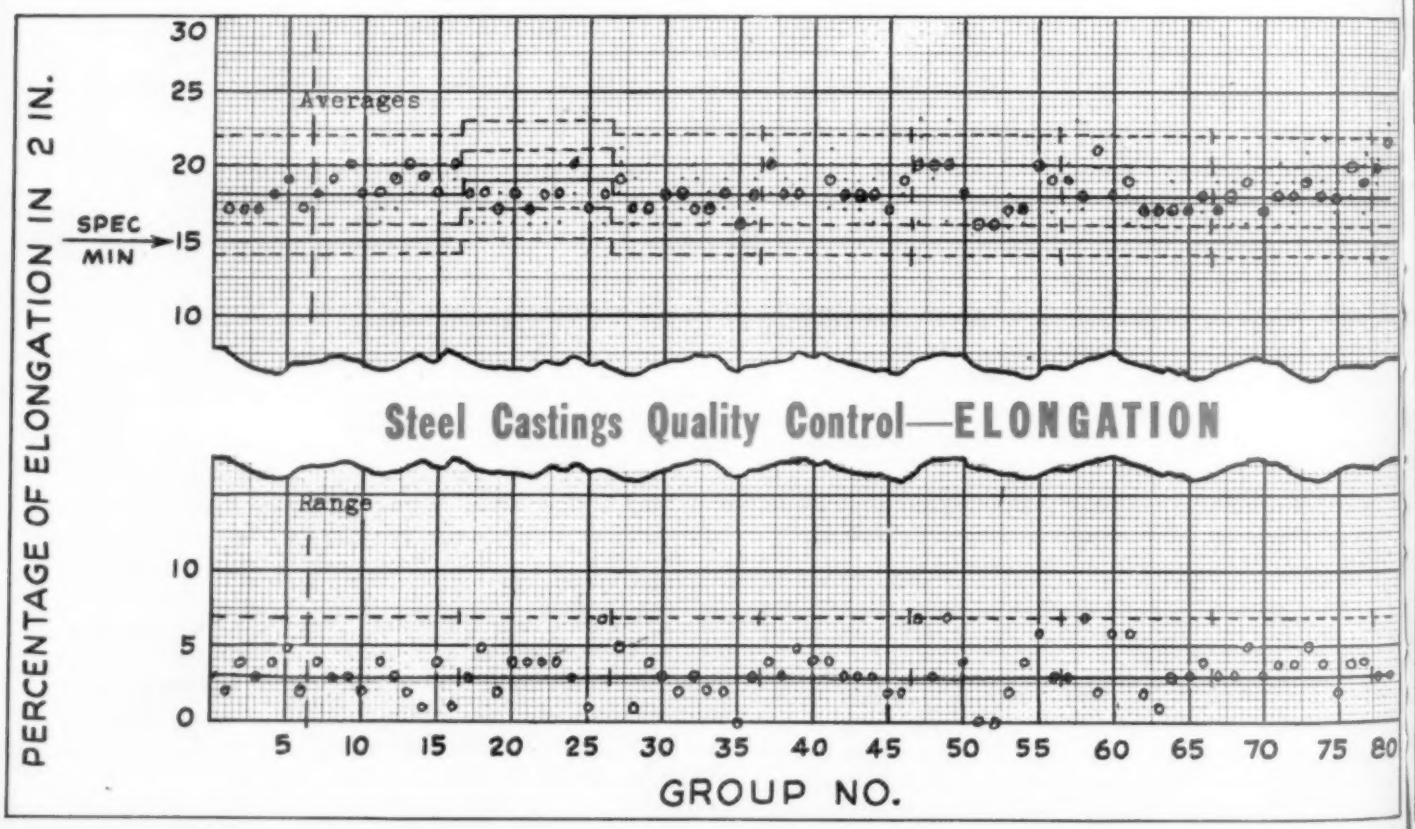
It pointed out the possibilities and advantages of alloy scrap melting in the production of alloy steels, and was utilized by many steel foundries, not only effecting savings to themselves but contributing immensely to the war effort by conserving thousands of pounds of much needed alloys.

We at Unitcast Corp. review our alloy program for the year of 1944, or 12 consecutive months of melting under this program, as a supplement to the October report.

During these 12 months we melted in accordance with the proposed plan in our two foundries, using both 3-ton top charge and 1½-ton chute charged acid electric furnaces. Alloy scrap purchased on the open market consisted of flashings, tong ends, plate, bar, clippings, scrap parts, etc., in N. E. 8600, S. A. E. 4300, straight molybdenum steels, and others containing nickel, chromium, and molybdenum, separately or combined. The results of the two foundries are combined for convenience, giving the data shown in Table I.

By analysis of finished product and proportioning the alloy content between virgin alloys used and remelt scrap alloy recovery, we attribute the following alloy recoveries to the purchased alloy scrap: Nickel 119,959 pounds, chromium (or chrome) 65,742 pounds, and molybdenum 26,782 pounds. This means that virgin alloys in this amount were released to the production of other steels for the war effort.

We further estimate a total savings of 470 furnace hours



Procedure

based on time savings on each heat made under this program as compared to the regular practice of adding virgin alloys to the steel bath during finishing.

The alloy steel produced during this period came under QQS-681-B, 4C2 specification; Foundry No. 3, the largest producer was placed on quality control for this grade of steel and has maintained this control over the entire period. Quality control charts shown here depict the results obtained.

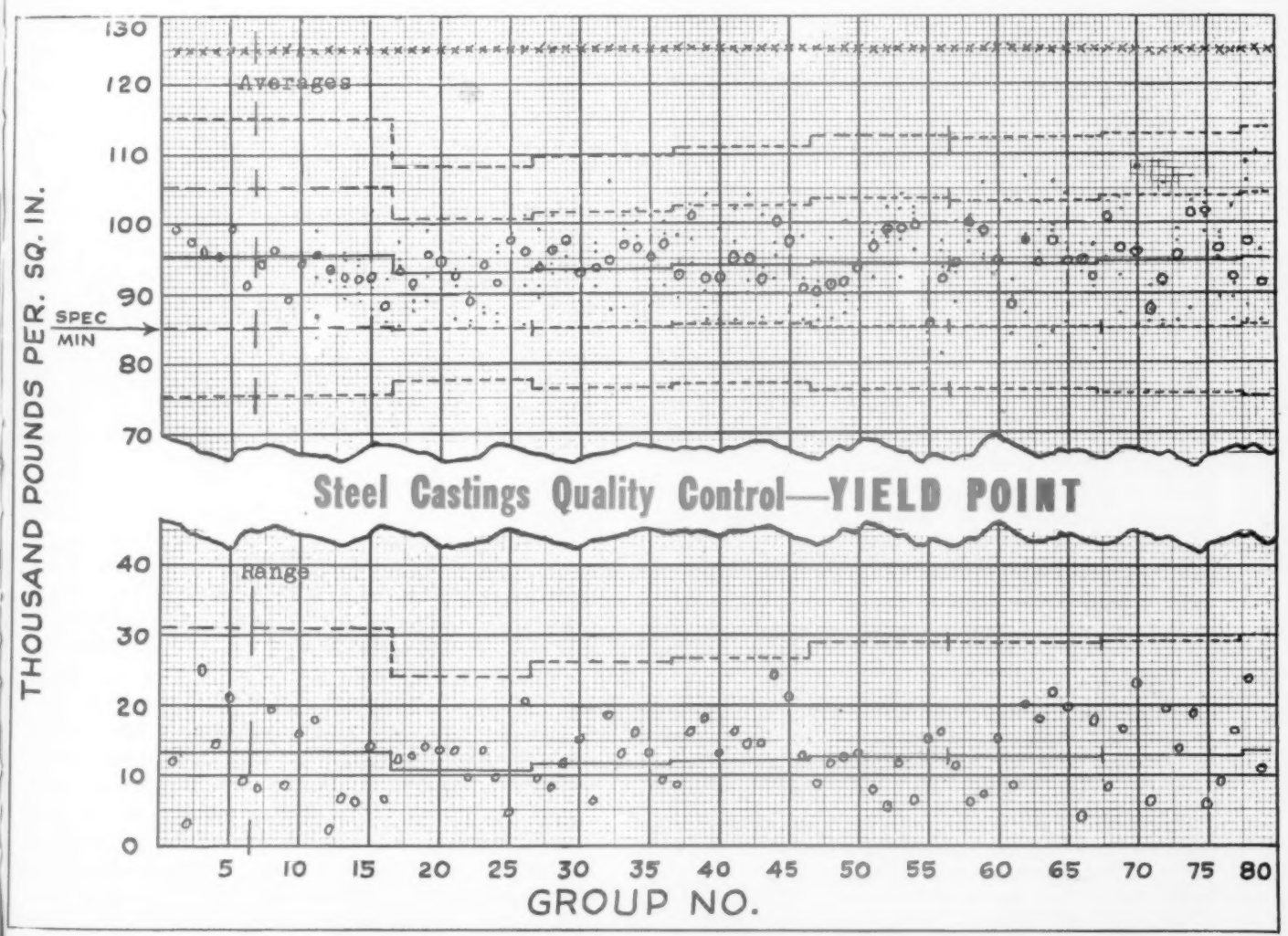
Such a program necessitates close control and alertness for success, and great credit must be given for their close co-operation to the entire metallurgical and melting staffs under Robert T. Jansen, chief metallurgist.

It might be pointed out that quality control is a statistical method of controlling the manufacture of a product in which there will be a large quantity of items which are either to be identically the same or the qualities are to be of the same identical nature. As long as the only differences in the quality of the product are fluctuations that can be ascribed to chance causes, it can be assumed that the manufacturing process is operating in a controlled and uniform manner. So long as the condition exists the plan allows testing to be done on a much reduced scale. But if the fluctuations become too great to ascribe to chance causes, then testing of each item must be resumed until the process is again under control.

Quality control charts shown in Figs. 1 and 2 are for physical tests representing steel castings manufactured to meet Federal Specification QQS-681-B Class 4C2 Modified. This specification calls for tensile strength of 105,000 pounds per square inch, yield point 85,000 pounds per square inch, elongation in 2 inches, 15 per cent, the percentage of reduction of area 30 per cent. The controlling factors used on this specification are the yield point and the percentage elongation. These along with their range values are plotted against the groups from which they are taken. The dots and circles represent individual and group tests, respectively. That is, four individual tests which represent twelve heats are averaged to give one average or group test. (*Please turn to Page* 198)

Table I—Data on Heats and Scrap Melted

Total number of heats melted	1880
Alloy scrap (purchased) charged	12,662,760 lb.
Alloy scrap (shop remelt) charged	7,469,800 lb.
Total alloy scrap charged	20,132,560 lb.
Total scrap charged	20,889,000 lb.
Percentage of alloy scrap (purchased) melted	60.62
Percentage of alloy scrap (remelt) melted	35.76
Percentage of total alloy scrap melted	96.38



By FRANK S. McELROY
and
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Injuries and Accident Causes IN THE FOUNDRY INDUSTRY

Solution of the foundry safety problem requires detailed information as to where and how accidents occur. A survey of the industry's 1942 experience was designed to supply some of these data and is discussed in this and succeeding installments. The article is abstracted from a forthcoming Bureau of Labor Statistics bulletin, which will contain additional details and all of the tables upon which the discussion is based

IT HAS long been recognized that foundry work includes some of the most hazardous operations found in any manufacturing activity. Reflecting these hazards, the frequency of disabling industrial injuries in independent iron and steel foundries (independent in the sense that they are exclusively foundry establishments and not departments of larger manufacturing establishments) has consistently been more than double the national average for all manufacturing. In 1942, for example, the frequency rate for the independent iron and steel foundries was 49.7 disabling injuries per million employe-hours worked, compared with the average of 19.9 for all manufacturing. In 1943 the comparative rates were 47.6 and 20.0, respectively.

General frequency rate comparisons of this type, however, serve only to demonstrate that a safety problem exists and to indicate broadly the magnitude of the problem. For the solution of the problem much more detailed information is necessary. The survey of 1942 experience upon which this discussion is based was designed to supply some of those details.

Coverage in this survey was extended to include not only the independent iron and steel foundries, but also foundries using nonferrous metals, and the foundry departments of establishments which are normally considered part of other industry groups. The participating foundries were classified into three major groups: Ferrous job foundries, nonferrous job foundries, and other than job (or non-job) foundries. For more specific comparisons the ferrous job foundries were divided further into gray iron foundries, malleable iron foundries, steel foundries, and cast iron pipe foundries.

The reporting units included 850 ferrous job foundries, 441 nonferrous job foundries, and 897 non-job foundries, most of which were departments of larger manufacturing plants. In the aggregate these 2188 foundries in 1942 had nearly 246,000 employes who worked more than 553 million employe-hours during that year. The total number of disabling injuries reported was 25,363, of which 92 resulted in death, 30 resulted in permanent total disabilities which will prevent the injured persons from ever again engaging in any normal occupation, 680 caused permanent physical impairments, and 24,561 resulted in temporary disabilities involving an average time loss of 15 days each. In the ferrous job foundries, approximately one in every eight employes experienced a disabling injury during the year. In the nonferrous job foundries and also in the non-job foundries the ratio was about one disabling injury for every 12 employes.

The nonferrous job foundries, with an average of 35.3 disabling injuries for each million employe-hours worked, had the best injury record among the three major groups. The non-job foundries had the next highest average frequency rate, 37.3. It was characteristic of the departmental foundries that those attached to industries which normally have low injury-frequency rates had better safety records than similar foundry departments of the industries with higher rates. As the operations performed were generally quite comparable, it seems reasonable to infer that these differences were the result of variations in the amount of attention devoted to safety, rather than differences in the prevailing hazards.

The entire group of ferrous job foundries included in this study had an average frequency rate of 52.0. Within this group, however, the gray iron foundries had an average of 55.8 disabling injuries per million employe-hours worked, the highest for any type of foundry operations; the steel foundries had an average of 50.8, the malleable-iron foundries 49.3, and the cast-iron pipe foundries 46.2.

In addition to reporting the lowest injury frequency, the

nonferrous job foundries also reported a much lower proportion of fatal cases than either of the other foundry groups. In part, the lower frequency rate as well as the lower proportion of serious injuries in the nonferrous job foundries probably was due to the lighter type of work done there. The highest proportion of serious injuries, both fatalities and permanent impairments, occurred in the non-job foundries, but no specific reason for this tendency was noted. As between the ferrous job foundries and the non-job foundries, there was little difference in frequency rates for serious injuries. The ferrous job foundries, on the other hand, had a much higher frequency of temporary disabilities than the non-job foundries.

A possible explanation of the difference in the frequency of injuries causing temporary total disability is that many of the non-job foundries were departments of larger plants which have medical units that give treatment for injuries on the premises and on company time. In such plants many injured workers have their injuries treated and return to work without chargeable absence from the plant. Such injuries would not be reported as disabling under the standard definition of a disabling injury, as they involve no lost time beyond the day of injury.

Among the ferrous job foundries, on the other hand, many are of insufficient size to maintain a medical office, and treatment for injuries must be obtained outside the plant. As a result, in numerous cases injuries which merely need redressing or observation on days following the day of injury may require the employe to remain away from work in order to obtain treatment. Consequently, certain injuries must be counted as disabling and therefore be included in the frequency rates of some plants, whereas identical cases in other plants are classed as nondisabling and are excluded from the frequency rates, depending entirely upon the availability of medical attention at the workplace.

Medical Facilities Affect Report

It is possible therefore that, as the frequency of fatalities and permanent impairments (which is not affected by the factor of lost time) was approximately the same for both the ferrous job foundries and the non-job foundries, the considerable difference in the frequencies of temporary total disabilities for the two groups may have been due at least in part to differences in plant medical facilities and not entirely to differences in the actual number of injuries.

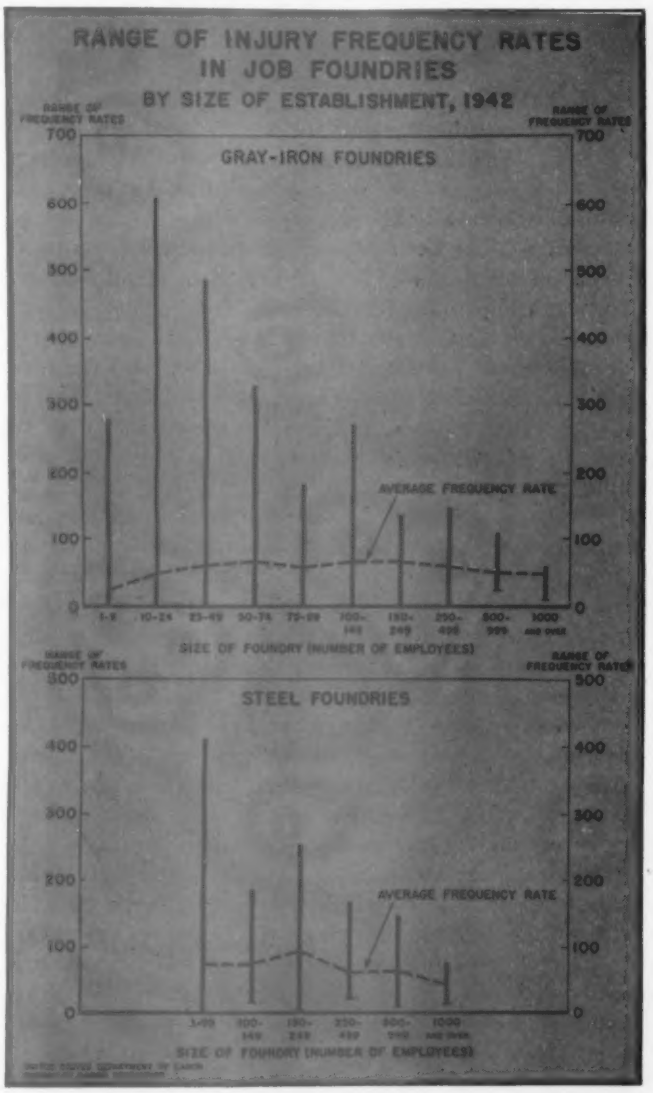
Basically, the difference between the frequency rates of the ferrous job foundries and the non-job foundries lies in the fact that most of the latter group are production foundries. Such foundries usually produce hundreds of standardized mass production. The work is highly mechanized and each step is more easily engineered for efficiency and safety. The procedures are subdivided and workers are trained in the performance of standardized operations, which leads to a high degree of understanding at each stage in the process.

This mechanization, engineering, and high degree of familiarity with the individual operations can do much to overcome the inherent hazards of foundry work and is largely the reason that non-job foundries have better safety records than job foundries. In addition, the departmental foundry has the advantage of sharing in the benefits of overall plant medical and safety (*Please turn to page* 230)

Injury Frequency Rates, by Kind of Foundry and Department, for 2188 Foundries, 1942

Department	Ferrous job foundries	Nonferrous job foundries	Other than job foundries
Total	52.0	35.3	37.3
Pattern shops	20.2	20.9	12.2
Wood	21.2	•	15.0
Metal	29.8	•	7.4
Not specified	8.7	•	5.2
Core room	30.9	12.7	18.6
Molding, including shakeout	59.7	34.2	43.0
Shakeout only	110.3	•	85.9
Melting	68.0	74.2	53.1
Crucible	•	57.4	34.4
Cupola	69.8	•	61.7
Electric furnace	77.9	•	46.2
Open-hearth furnace	51.8	•	•
Other	66.4	97.8	49.4
Cleaning, chipping, finishing	73.1	46.1	50.2
Heat treating	47.8	•	30.5
Service and maintenance	51.1	•	•
Administration	3.8	5.8	•
Clerical	3.4	2.3	•
General labor	91.4	•	46.5
Machine shop	25.2	•	•
Maintenance	40.1	•	•
Metallurgical laboratory	8.3	•	•
Pattern storage	14.5	•	•
Power or heating plant	10.2	•	•
Shipping	36.9	•	•
Storage yard	59.5	•	•
Yard transportation	52.3	•	•
Miscellaneous	51.4	39.1	30.0

•Not shown separately because of insufficient coverage.


RANGE OF INJURY FREQUENCY RATES IN JOB FOUNDRIES
BY SIZE OF ESTABLISHMENT, 1942
GRAY-IRON FOUNDRIES
STEEL FOUNDRIES
AVERAGE FREQUENCY RATE
SIZE OF FOUNDRY (NUMBER OF EMPLOYEES)

Which foundries can profitably mechanize, and what will it cost? How completely should a foundry be mechanized? These and other questions are discussed by the author in his paper, which originally was presented before the annual meeting of the Gray Iron Founders' Society

Mechanization of Gray Iron Foundries

WHY should we consider the expenditure of a sizable sum of money to mechanize our foundries? First and foremost, we are driven to mechanization in order to meet the previously existing keen competition which will become more intense in the future. Competition has been and will continue to be the prime mover in advancement and improvement of all industry. Postwar competition will become keener than we have ever known, due to the tremendously increased capacity resulting from building of new foundries and improvements to existing plants. To survive will require production of better castings at a lower unit price. Unless we can do this we might just as well close shop and go fishing.

Another reason why we have mechanized our foundries is because of the need to increase production without increasing floor area or manpower. This has been the main reason for installing mechanical equipment in foundries during the war years. Some foundries had ample molding capacity but not the manpower to produce over their normal tonnage of castings. Therefore, it was vital that they install time-saving mechanical equipment that would allow them to produce more castings per man. Other foundries were able to hold together enough manpower to produce to their normal full capacity, but demands were very pressing for still greater production, and by the installation of modern melting practices, mechanical sand, mold and casting equipment they were able to vastly increase their production without any building program.

Another important reason why we have mechanized and will continue to mechanize our foundries is to secure better working conditions for the worker. This issue has been gaining strength right along and will continue to gain momentum in the future. In addition, labor has achieved a new high in earnings, and I think we should prepare ourselves to use this high standard of labor to advantage.

In the past, improvements first were made in every part of our plant except the foundry. The foundry was always last. Improvements were made in the machine shop and other departments. New machines and latest fixtures were installed and by the time we got around to the foundry there was no money left, so the foundry went along in the same back-breaking routine way that it had known for the last 50 years. New drinking fountains were installed in other parts of our plants and the old fountains put in the foundry under the label of an improvement, and in most cases it was a decided improvement.

Equipment Improves Working Conditions

We are now just starting to get away from these ideas and are installing modern equipment to lighten the work of the molder and other foundry workers and to make their working conditions better. Some of our newer foundries prove what can be done through mechanical sand preparation and handling, and improved mold and casting handling to lighten the physical load of the worker.

Much thought is being given to effective dust control, better lighting, and the removal of smoke, fumes and excessive heat. Bear in mind that it is only after modern sand, mold and casting handling equipment has been installed that we can proceed with any degree of efficiency to obtain these improvements. With older methods of molding, involving pouring molds all over the foundry, dumping the molds and shaking out the castings on the molder's floor, cutting the sand by hand, etc., it is impossible to secure any satisfactory improvements in conditions. Changes are necessary in operating technique.

By KENNARD LANGE
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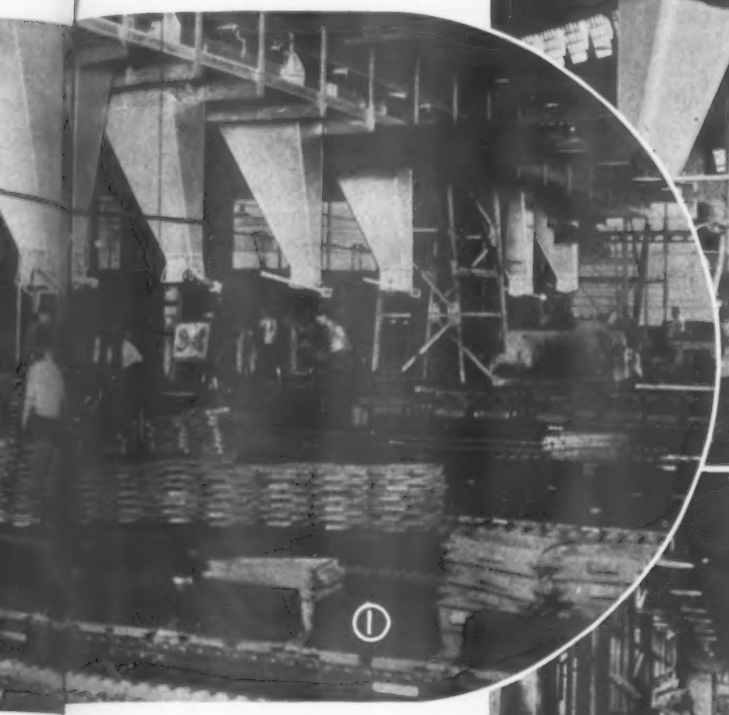

Fig. 1—In this foundry, batch muller preparation of sand assures accurate control and flexibility. Molds are stored and poured on gravity roll conveyors and transferred to a central shakeout by means of a transfer car. Note provision for handling and storage of flasks, bottom boards, arbors, etc.

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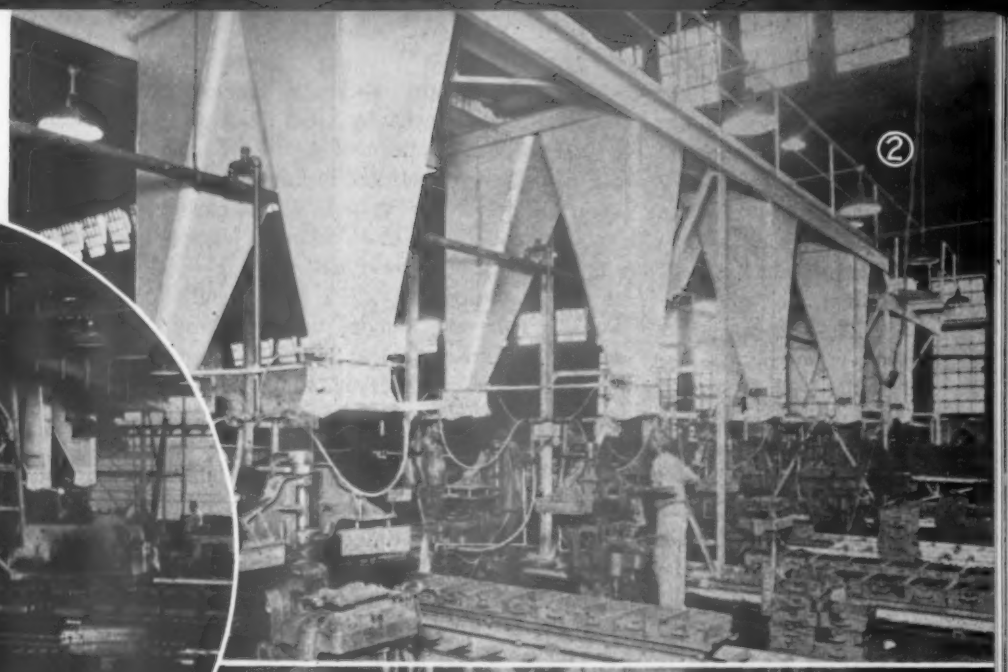

Fig. 2—Molders' hoppers are fed by conveyor and have duplex undercut gates for discharging prepared sand to molding machines as required. This equipment is employed in a foundry producing brake shoes

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Fig. 3—Showing conveyor for carrying molds through the closing, clamping, cooling and shakeout operations—continuously and automatically at maximum speed and efficiency

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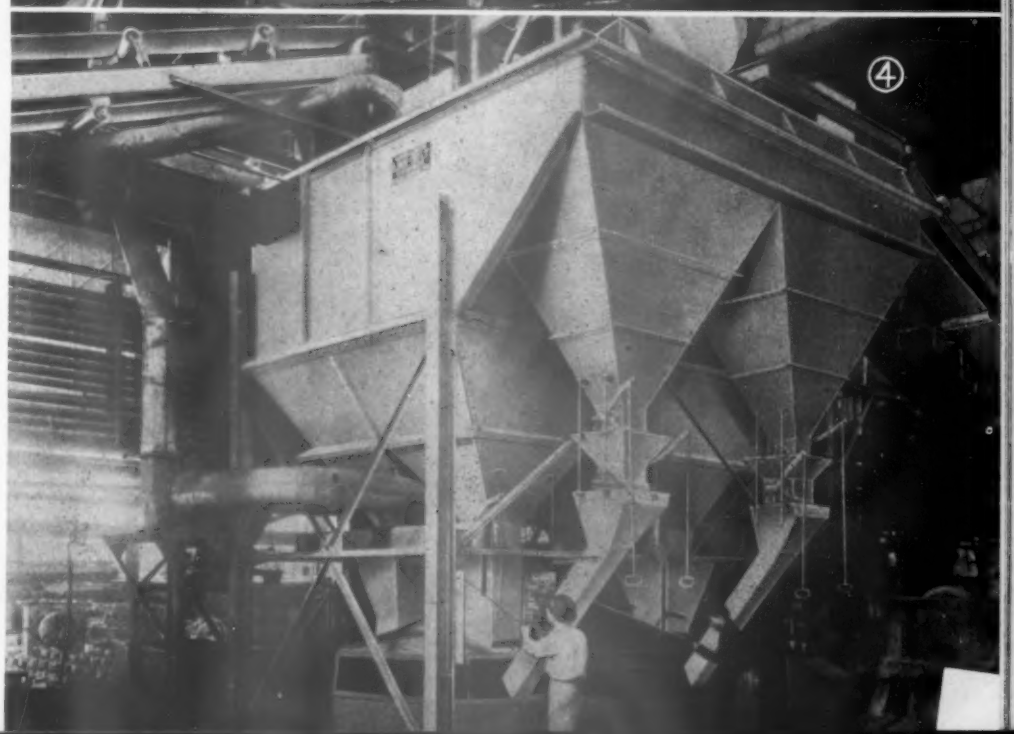


Fig. 4—Illustrating an 85-ton capacity, conveyor-fed sand storage bin with new-sand bins and measuring devices over two mixers

Better working conditions for the foundry worker is a relatively new reason why we should mechanize, but it has a very important place in the final pattern of a still newer and more potent factor—the competition for desirable foundry workers. You will note I have stated desirable workers, as it will only be with desirable workmen that we can hope to produce castings at a lower cost per unit to meet the keen postwar competition.

The present flight of workers from the foundry industry is appalling. Until we are able to make the foundry a place where a man will want to work, a place where he can work in a healthy, clean atmosphere such as can be obtained in other industries, we will not get the desirable element of labor.

For example, take two foundries in the same town. The first foundry is operating the same way it did 50 years ago and the second foundry is making castings under improved conditions with modern equipment. Molders and other workers from the second foundry will earn more because they will produce more in the same length of time and they will go home less tired at the end of the day than the men working in the first foundry. There is no doubt which foundry will secure the better, most desirable workers.

No Two Foundries Exactly Alike

So far we have limited our discussion to why we mechanize. In considering who can profitably mechanize and how completely a foundry should mechanize, many complications appear. It is doubtful if anyone can point out two foundries that are alike as to building layout, management, ideas, operating methods, patterns and molding machines. For example, take two foundries making the same castings; one will be making the castings in a snap flask using slip jackets, and the other in tight flasks; one using synthetic sand, and the other bank molding sand; one melting a rather high percentage of pig iron, the other very little pig and more scrap, and so on. Therefore, because of the numerous variables in different foundries, it has not been possible to set up definite standards for mold handling and sand preparation systems, even for certain classes of work. However, from past experience there have come certain fundamentals that can be accepted generally, as basic facts in planning operations and the installation of equipment. The following is a summary of these:

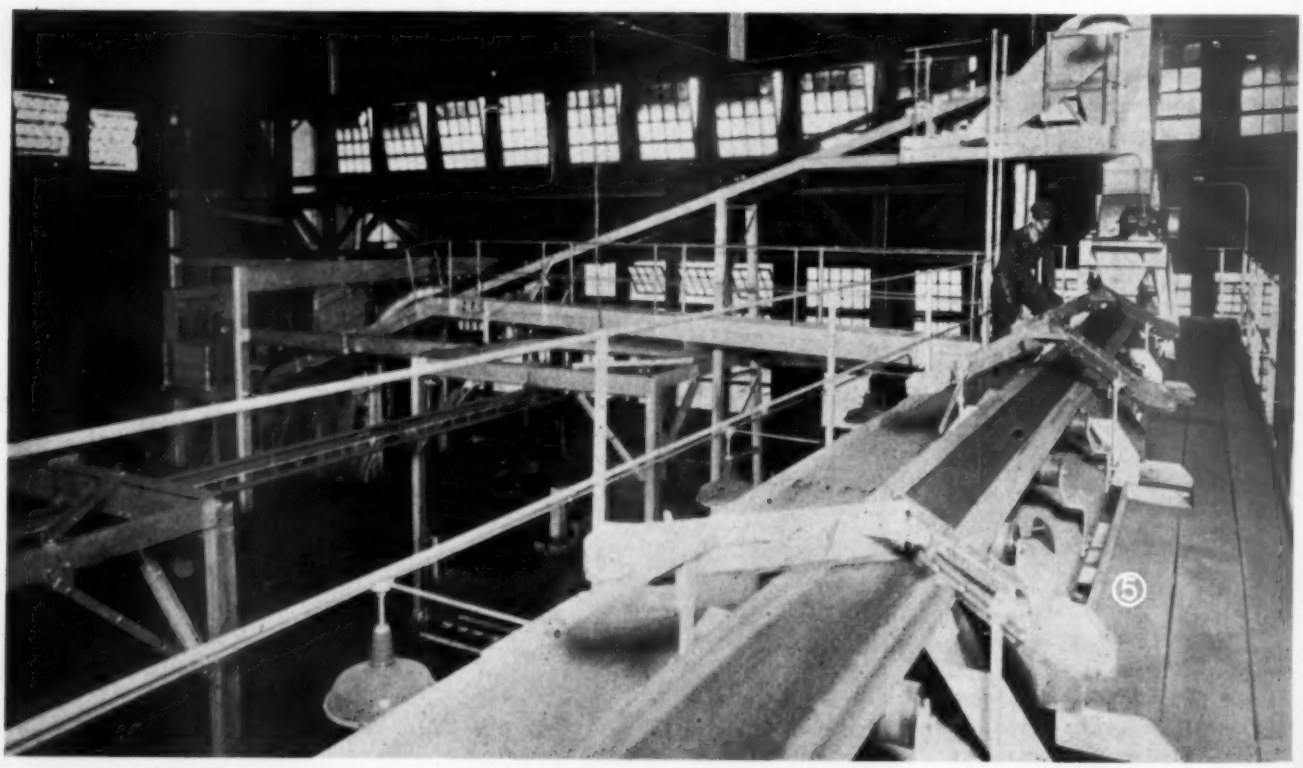
1. For the small jobbing shop making one of this and two of that, and having little or no repetitive work—say with an average melt of 10 to 20 tons per day—there is little question but that straight floor operation, with the minimum of equipment, is the most practical.

2. Continuous melting with continuous molding, pouring, shakeout and sand preparation, does bring about tremendous savings over batch operations, but also requires more careful planning and supervision on the part of management.

3. Equipment must be carefully planned and designed to suit the class of work and the production requirements. The only failures of mechanical equipment in foundries have occurred when the equipment was not properly planned or designed for the specific requirements. Careful and proper engineering is essential to guard against too elaborate or too expensive equipment for the material or tonnage to be handled. In this connection, accept clever ideas but avoid extreme and tricky devices. Strive for a happy medium in amount of equipment and operating features. The ideal, completely automatic foundry is still in the future.

(*Please turn to Page 220*)

Fig. 5—View in same brake shoe foundry as in Fig. 2 shows a 20-inch wide inclined transfer belt conveyor to a sand revivifier from which the 20-inch belt conveyor in foreground distributes prepared sand by means of adjustable scraper discharge plows to storage hopper over any desired molding station



Clarence E. Sims
Robert E. Kennedy
Rear Adm. A. H. Van Keuren
M. J. Gregory
Ralph J. Teetor

NAMED FOR

A.F.A. Awards

CLARENCE E. SIMS

ROBERT E. KENNEDY

REAR ADM. A. H. VAN KEUREN

M. J. GREGORY

BOARD of Awards of the American Foundrymen's Association, meeting in Chicago, Jan. 16, made the following selections for awarding of medals and life memberships:

The Penton Medal of A.F.A. to Clarence E. Simms, supervising metallurgist, Battelle Memorial Institute, Columbus, O., for "outstanding work in behalf of the steel foundry industry."

The Joseph F. Seaman Medal of A.F.A. to Robert E. Kennedy, secretary, American Foundrymen's Association, for "his outstanding and long continuous work on behalf of the foundry industry in general."

Honorary life memberships to Rear Admiral A. H. Van Keuren, USN, director, Naval Research Laboratory, Anacostia Station, Washington; M. J. Gregory, retired national director of A.F.A.; also to Ralph J. Teetor, president, Cadillac Malleable Iron Co., Cadillac, Mich., as retiring president of A.F.A., and to Messrs. Sims and Kennedy as 1945 medallists.

These selections were approved by the national board of directors at its midyear meeting Jan. 17. Because of the cancellation of the 1945 convention, originally scheduled to be held in Detroit early in May, the medals and honorary life memberships will be presented at the association's business meeting to be held in July. This will be at the time of the annual meeting of the board of directors but will be on a curtailed scale in keeping with the government's appeal for conserving transportation. Public recognition will be given the recipients at the next convention held by the association.

The A.F.A. Board of Awards consists of the seven immediate past presidents of the association, as follows: Chairman, Lee C. Wilson, Reading Steel Casting Division, American Chain & Cable Co. Inc., Reading, Pa.; Duncan P. Forbes, Gunite Foundries Inc., Rockford, Ill.; Herbert S. Simpson, National Engineering Co., Chicago; Lester N. Shannon, Stockham Pipe Fittings Co., Birmingham; Henry S. Washburn, Plainville Casting Co., Plainville, Conn.; Marshall Post, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., and Hyman Bornstein, Deere & Co., Moline, Ill.

Clarence E. Sims was born in Chicago, where he received his early education. He was graduated from the University of Illinois with a bachelor of science degree in Chemical Engineering, continuing his studies at the University of Utah, where he received his master of science degree. He then entered industry, serving in various capacities with the Anaconda Copper Mining Co., Anaconda and Great Falls, Mont.; Michigan Electrochemical Co., Menominee, Mich.; R. W. Hunt Co., Chicago; Research Division, Chemical Warfare Service, Washington; Aluminum Co. of America, Niagara Falls, N. Y., U. S. Bureau of Mines Experiment Station, Seattle, and Pittsburgh, and American Steel Foundries, East Chicago, Ind. Early in 1937 he was appointed supervising metallurgist of Battelle Memorial Institute. Mr. Sims has long been active in work of A.F.A. committees and is the (*Please turn to page* 184)

By JOHN VICKERS
Foundry Manager
Rolls-Royce Ltd.
Glasgow, Scotland

Permanent Mold Ca

A GOOD example illustrating the merits of gravity die casting is provided in the case of the die casting is provided in the case of the die, with a boost control casting therefrom, shown in Fig. 6. As a sand casting, this is difficult to produce under mass production conditions owing to the large number of separate cores necessary in the manufacture of the molds, with the consequent effect of increasing the cost and the risk of errors due to large number of operations involved. Furthermore, the presence of chill and core joint marks on the castings would result in a much inferior surface finish and accuracy.

On the other hand, the design of the casting lends itself freely to die casting in that a simple die can be designed at a reasonable initial cost, capable of producing thousands of sound castings.

The die is parted in three planes, corresponding to faces on the casting, which facilitates the use of an effective running system while maintaining ease of cleaning of the casting and simplicity in die construction. To avoid straining the casting on opening the die, the three die blocks are actuated by means of simple levers pivoted to the die base, light blows on the levers being sufficient to draw the blocks away from the casting with a parallel motion and with the very minimum of strain.

Top pouring through the riser has been adopted on this job, the reason for this being that, despite the fact that it would be exceedingly difficult and somewhat impracticable to incorporate an effective bottom-running system, the relative positions of the heavy sections demand progressive solidification from the bottom to the top with adequate liquid head metal to feed the heavy sections during solidification. Hence the top runner, which insures the hot metal being in the risers and the coldest metal in the bottom of the mold. With direct top pouring all the evils associated with turbulent metal become evident, therefore, in this case, to prevent the metal cascading over the intricate die cavity walls, the complete

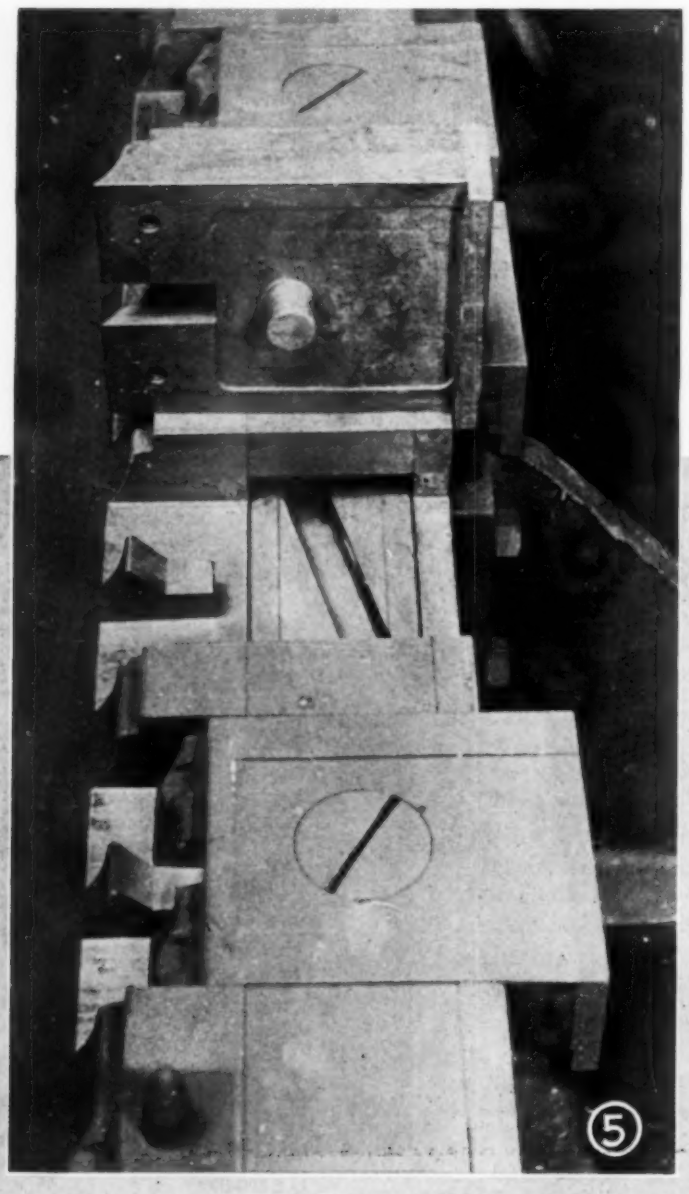


Fig. 5—Core withdrawing mechanism of rocker cover mold. Fig. 6—Boost control casting mold construction. Fig. 7—Coolant inlet mold construction. Fig. 8—Construction of mold for cover plate and guide casting

dCastings

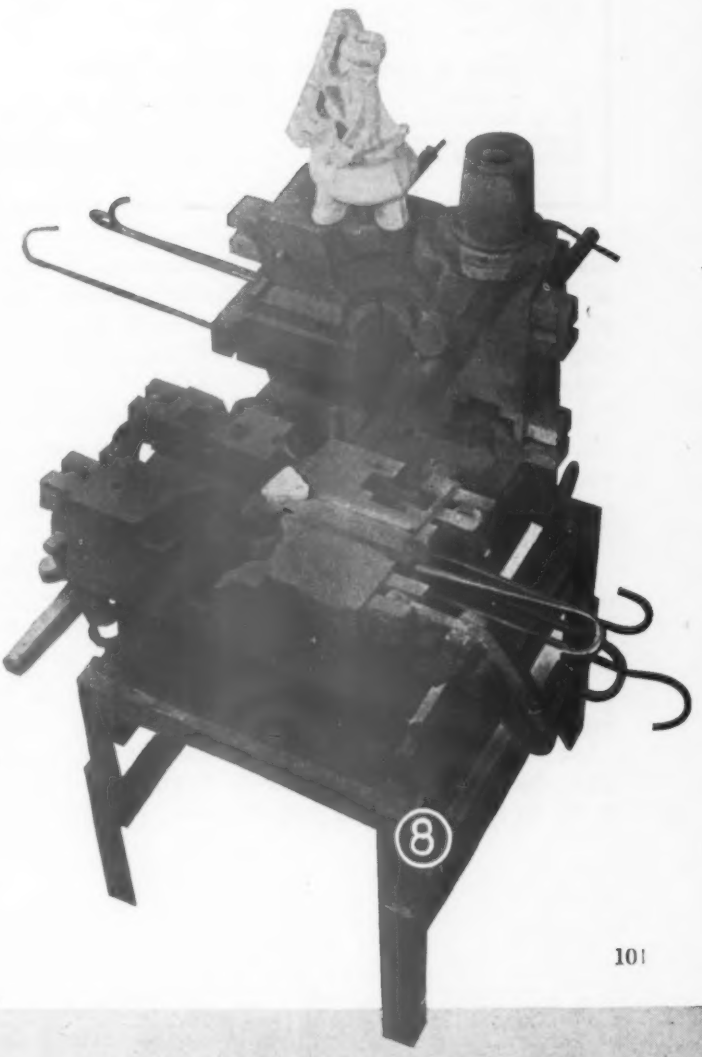
This concluding article of two from the official exchange paper of the Institute of British Foundrymen, presented at the annual meeting of the A.F.A., describes molds and procedures in casting with permanent molds

mold is tilted on a pivoted table at a steep angle at the commencement of pour and the metal introduced in a steady, unbroken stream, the level of the table being returned to the horizontal position as the mold fills. The tabulation in Table III shows the advantages of die casting over the sand casting on this part.

The rocker cover illustrates what can be achieved in the way of manufacturing large castings of thin section, this particular casting being some 3½ feet long, with a metal thickness of 0.15-inch, and is, of necessity, made in an aluminum-silicon alloy possessing maximum fluidity. However, despite this property, auxiliary heating by means of gas burners placed below the base of the die has had to be introduced to assist the metal to run freely.

The metal is poured from two positions, a sloping runner being situated at each end of the casting and gated into the base of the feeding head. This method is superior to pouring the metal directly down the feeding head in that it minimizes turbulence. Numerous risers are situated around the top of the casting for feeding purposes.

The presence on the casting of a number of clamping-down lugs placed below the flange, to facilitate machining in the machine shops, has necessitated the use of drawback cores in the die base to enable the casting to be lifted out. By means of the mechanism shown in Fig. 5, which is actuated by a rack and pinion movement situated at one end of the die, all these cores are withdrawn simultaneously. Moving the longitudinal steep strap shown imparts the necessary motion, through cams and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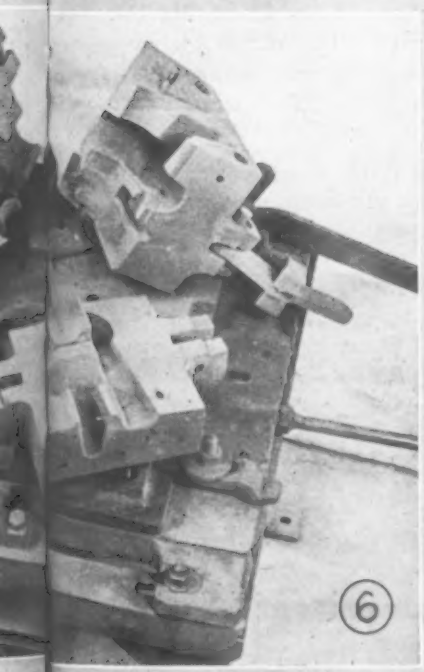
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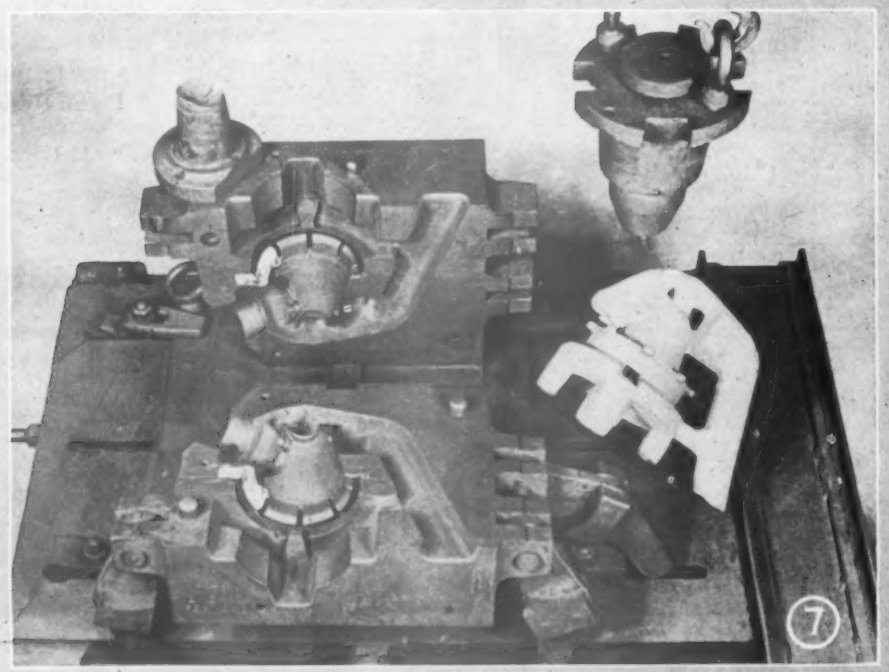
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Table III—Boost Control Casting

Details	Sand-Cast	Die-Cast
Bonus time allowance, min.	125.500	35.000
Finished casting weight, lb.	3.928	3.687
Labor cost per casting, dollars	0.450	0.142

Table IV—Rocker Cover Casting

Details	Sand-Cast	Die-Cast
Bonus time allowance, min.	264.000	93.500
Finished casting weight, lb.	12.750	9.687
Labor cost per casting, dollars	1.138	0.350

Table V—Cover Plate and Guide Casting

Details	Sand-Cast	Die-Cast
Bonus time allowance, min.	66.000	44.75
Finished casting weight, lb.	1.875	1.706
Labor cost per casting, dollars	0.213	0.142

cam paths, to the cores. The top core forming the inside of the casting is located on four dowels in the die base, one at each corner of the core, thus insuring accuracy of alignment relative to the die cavity without relying on the runner blocks.

The purpose of mounting the die on special legs is for ease of transport to and from the cleaning and maintaining section. The comparative data of producing rocker cover castings by both sand and die-cast methods are shown in Table IV.

A die for a very intricate casting is shown in Fig. 8, this particular job representing the highest achievement in die design and manufacture.

From the die designer's point of view, difficulty is experienced in designing a die to collapse away from the irregular contour and numerous undercuts of the casting while at the same time maintaining strength and rigidity. This object has been achieved by forming most of the cavity in loose cores and pick-off pieces, i.e., cores that, when the die is opened, remain in position on the casting, to be afterward removed, the two die blocks only forming a small section of the cavity but containing the runners and risers and acting as an assembly piece for the various cores.

In order that the die blocks may be opened without fear of wrenching the casting, they are guided in direction of travel on the die base by means of keys, and a special opening device has been incorporated to insure that the die halves are parted parallel to each other. This takes the form of a cam on the split-line of the die at each side of the casting and is actuated by levers projecting from the die base. The operation of drawing back the blocks then leaves the casting suspended, with loose pieces attached, on a bottom core in the die base, from which it is removed by withdrawing the core with the aid of a cam action situated in the base.

Because of the intricacy of the die cavity, bottom pouring is absolutely essential, therefore, the metal is directed down an inclined runner and through a ring runner into the bottom of the casting. To obtain ideal thermal conditions in the solidifying metal, the runner is gated into a boss part way up the casting and then into the base of the top riser, thus insuring hot metal for feeding purposes.

Care and Skill Are Required

The presence of many intricate and delicate loose pieces in the die calls for care and skill on the part of the operators in order to insure the proper alignment of same. Methods, such as dipping the cores in colloidal graphite after every cast, are introduced to facilitate removal from the casting with the minimum of exertion. As in the case of the previous example, the sand and die-cast methods can be compared from data in Table V.

The die for a coolant inlet casting is constructed in two-block form, a large top core forming the inside of the casting and a side core forming the angular boss. This latter core is located in position by means of a substantial dowel pin in the side of the die. Fig. 7 illustrates the general construction.

It will be observed that a huge body of feed metal has been provided in the bottom of the die, the purpose of which is to feed a heavy boss on the inside of the casting directly above it. A gate has been cut into the thin wall of the casting to supply heat to this section, thereby avoiding hot tearing due to excessive solid contraction.

Because the dimensions of the (*Please turn to Page 200*)

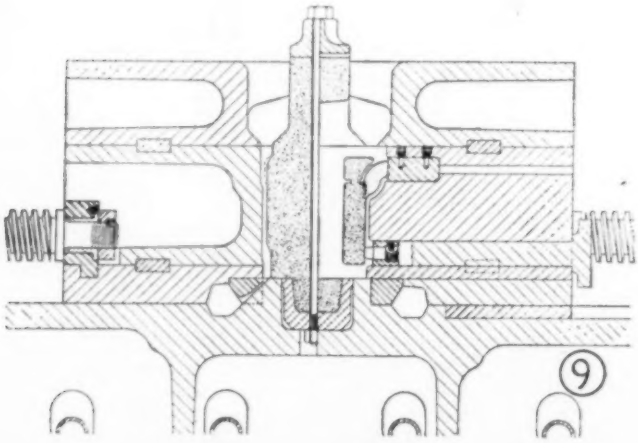


Fig. 9—Enlarged cross section showing method of feed.

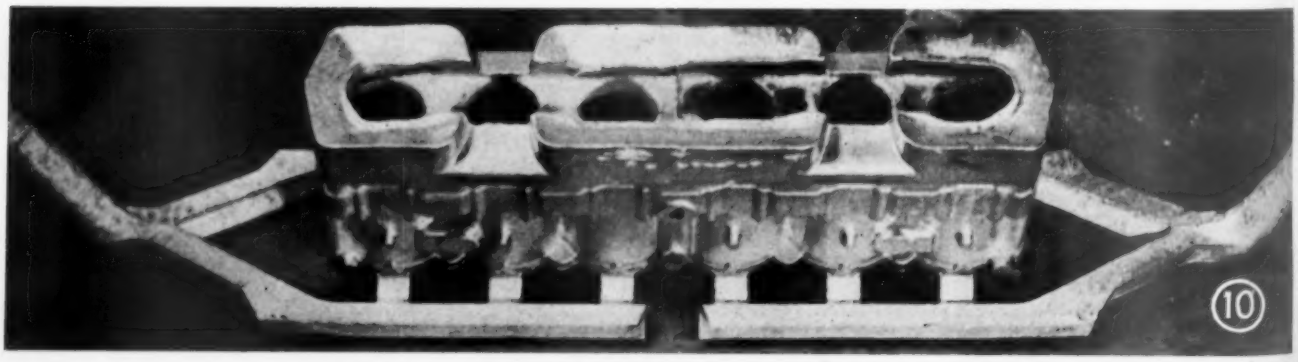


Fig. 10—Cylinder skirt permanent mold casting with runners and risers

MATCHPLATES
Save Foundry Time

WITH the exception of open sand molds, every mold has a parting line between cope and drag. Some molds have two or more parting lines where the mold is parted or separated for the purpose of taking the pattern from the sand. The parting may be flat as in the so-called flatback type of pattern where the entire pattern is molded in the drag and the cope merely serves as a flat cover. This also applies to a mold made from a split pattern in which part of the pattern is molded in the drag and the remainder of the pattern is molded in the cope.

Many patterns present an irregular contour at the parting line. In such instances the molder has to build up or cut down the sand in the vicinity of the pattern so that the cope and drag may be separated for extraction of the pattern. In other instances the parting line may be some distance below the top of a solid pattern. The solid ball pattern shown in Fig. 1 is fairly typical of many patterns in which the molder has the choice of three alternative methods in ramming the drag. He may fill the drag with sand as at *A* and then scrape or scoop a hole in the center in which the pattern is rapped down until a center line through the equator comes flush with the joint line of the drag.

Joint May Take Several Forms

In *B* the ball is placed on a plain rollover board. The drag is rammed and rolled over and a parting is cut with the trowel down to the center line as at *C*. In example *D*, blocks corresponding to half the height of the ball are placed between the rollover board and the edges of the drag. When the drag is rolled over, half the ball will appear above the parting of the drag as at *E*.

In each case superfluous sand must be removed and the parting made by hand. Joint *C* is the most difficult and takes the most time. An inexperienced man will form the parting as indicated by the dotted line. This is satisfactory so far as separating the cope and drag and the subsequent removal of the pattern are concerned, but the sharp edge on the body of sand hanging from the cope easily is broken and may fall into the mold and ruin the casting. The proper style of parting is shown in the full line. A substantial body of sand provides room for nails, gaggers or soldiers.

The type of parting shown at *B* is used only when the bars in the cope are flat and thus prevent the upper part of the pattern from projecting into the cope. All the trouble of making the parting by hand may be eliminated by providing a rollover board as shown at *F*. When the drag on this board is rolled over the parting is ready made. The parting in example *D* likewise may be simplified by placing the pattern in a recess in the rollover board as shown at *G*. When the double deck rollover board is removed, one half the ball (*Please turn to page* 207)

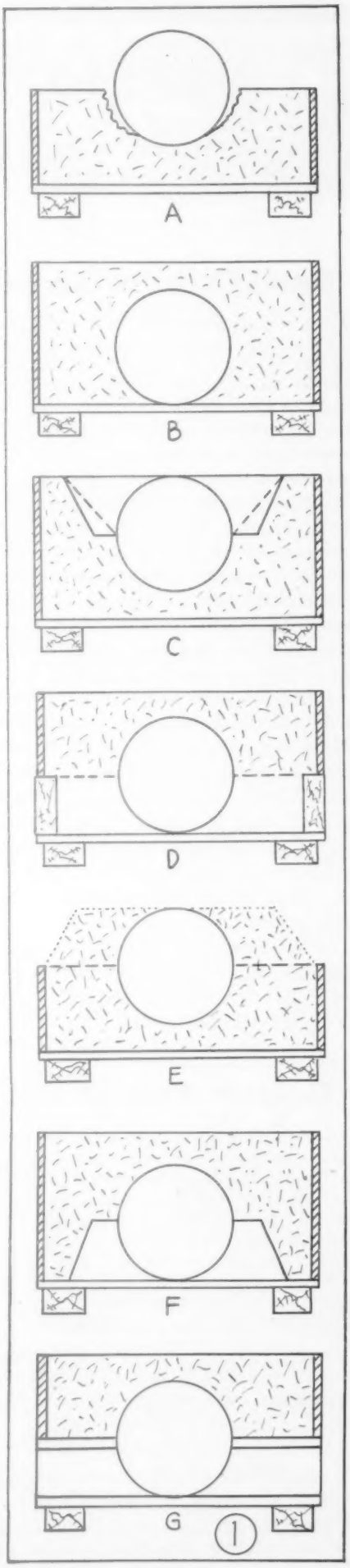


Fig. 1—Solid ball pattern is fairly typical of many patterns in which the molder has choice of three alternative methods in ramming the drag

QUESTIONS and ANSWERS

Sand Core for Smooth Cavity

Q.—We shall appreciate your recommendation for a facing sand for ingot molds ranging in size from 1½ x 6 x 59 inches, to 2½ x 7½ x 103 inches, and in weight from 150 to 700 pounds. The castings are made horizontally in green sand molds.

A.—Composition of the facing sand for these long slab molds is of secondary importance and may consist of any combination within reason. The actual composition will depend on the available sand, and to some extent on the preparation equipment. A typical mixture will show: Old sand 60 to 70 per cent, new sand A.F.A. fineness 140, 30 to 40 per cent, bentonite 2 per cent, pitch 1 per cent and sea coal 5 per cent. Physical characteristics of this mixture will include: Clay content 15 per cent, moisture 6 per cent, green compression 8.5 to 10 pounds per square inch, permeability 100.

The really important feature in making these castings is the manner in which the sand is rammed and vented in the drag face of the mold. With metal on top and along both sides of the long narrow strip of sand, an extraordinary volume of steam is created. Unless this body of sand is vented closely with a wire, the steam will not escape downward readily. A certain amount will break through the face of the mold and the result will be a dirty, rough and scabby face, irrespective of what type of facing sand is employed. If that form of defect is the cause of your inquiry, the simplest solution is to attach a core print to the bottom of the pattern, and use a nice, smooth, blacked, oil sand core to form the long cavity in the casting.

Defects Appear Under Risers

Q.—We shall appreciate your opinion on the cause of shrink holes in some cast iron liner castings, 60 inches in length and 2 inches metal thickness. The castings are made in dry sand molds and poured in a vertical position through two gates, one at the bottom and the other about half way between the bottom and top. A large side riser at the top is fed with a rod. Shrink holes or internal segregation below the riser shows up when the casting is machined.

A.—If the defective areas, the shrink holes and segregation, appeared in several places, the blame could be placed on a wet or hard and tight mold or core which caused the metal to boil. This boiling action produces small collections of bubbles which float on the rising metal like pieces of sponge. Where loose sand is carried in through the sprue and gates, or washed from the face of the mold, this material unites with the spongy floating material. In rare instances the mess floats to the top. In the majority of instances, it is arrested at some point in the upward passage by touching the cold walls of mold or core, where it remains anchored, only to appear later when the face is cut by a machine tool.

The trouble partly may be caused by the gating system. Metal entering the mold through a bottom gate gradually becomes colder as it rises in the mold. A film develops on the top and this film has a tendency to hold any rising foreign material in contact with the wall of the mold or more. A better method is to pour the casting through a ring of pop gates on the top. This method was adopted by the cast iron pipe makers over 70 years ago, but with traditional conservatism has been practiced in other types of foundries only in comparatively recent years. In this method the casting solidifies gradually from the bottom. The last and hottest metal is at the top where it is needed to compensate for any slight shrinkage. Instead of an auxiliary riser to be pumped with a rod, the casting is extended a few inches. This extra metal ring afterward is cut off.

Desires Permanent Mold Data

Q.—In the January issue we read the article by L. F. Swoboda on permanent mold castings which interested us very much, and we would like to obtain more information on the process. As soon as the war is over we will be making a great many aluminum castings. For example we had one item which ran over 100,000 pieces a year which we made in sand—and we think we might be able to do it better in permanent molds. Can you recommend a book, or tell us how to get started?

A.—So far as we are aware there is no book devoted to the permanent mold process. A paper presented by John Vickers at the 1944 annual convention of the American Foundrymen's Association on "Mechanized Production of Aluminum Gravity Die Castings," and abstracted in the February and March 1945 issues of THE FOUNDRY, gives considerable information on permanent mold practice. Probably the most important phase is die design, and literature on that phase is practically non-existent. Hence, the easiest way to get into the field is to employ a skilled die designer. The only other way is to do it the hard way —by practical experiment.

Permanent molds usually are made of gray cast iron, and often are made of several pieces dowelled or otherwise fastened together. The sectional idea may be to provide adequate venting through the joints of the parts, to permit easy removal of the casting, or for quicker production of the mold. Castings usually are gated from the bottom, and the sprue is located angularly to the casting cavity to permit smooth flow without turbulence and splashing. In some cases the mold is mounted on trunnions so that it may be tilted during pouring to insure smooth flow of metal into the cavity.

Mold should be designed to promote directional solidification, and usually is thickest at the heavy casting section. In addition the mold may be finned or studded with pins at such points to provide greater radiating surface for more rapid cooling. At other points the mold may be insulated to give slower cooling. Gating system also is de-

signed to promote such solidification, and often the gates lead into the thin sections so that the coolest metal enters the heavy casting section. Those are just a few of the details which must be considered in designing a mold, and as may be seen, involve considerable study and experience.

Cokes Are Different Quality

Q.—We are sending to you two cupola cokes we use, and which are marked *A* and *B*. Coke *A* bridges over, badly over the tuyeres, requires more limestone to draw off the slag, and burns out about 3 inches of lining in the melting zone on a 30 to 35-ton heat with a melting rate of 6.0 to 6.3 tons per hour. Although there is some bridging with coke *B* it is comparatively slight, and the tuyeres remain clean and bright throughout the heat. The coke requires less stone to draw off the slag, burns out about 1 inch of lining in the melting zone, and gives a melting rate of 6.5 to 7.0 tons per hour. Carbon pick-up and metal temperature are about equal for both types of coke. We would like to know if it is possible to overcome the undesirable factors in cupola operation derived from coke *A* and how it can be done. Iron charges contain 50 per cent steel with a final analysis of 1.50 to 1.60 per cent silicon, 3.10 to 3.15 per cent total carbon, and 0.85 per cent manganese. Coke bed is 2400 pounds and 63 inches above the tuyeres; coke splits are 350 pounds; metal charge 2000 pounds, and controlled air blast is 4400 cubic feet per minute.

A.—Examination of the two coke samples submitted for comment indicates that the one marked *B* is a good structure, hard-burned coke while that marked *A* is undercarbonized in approximately half its volume. That is to say that in manufacture the first few inches next to the retort wall are burned more or less satisfactorily, but the remainder toward the center was not burned sufficiently for good metallurgical coke. While we are not equipped to perform the necessary analytical work, appearances indicate that coke *A* will run considerably higher in volatile matter than coke *B*. A coke such as *A* will have a lower ignition point than the hard coke, and will burn faster. Effect of a coke of that nature is to narrow the zone of maximum temperature in the bed where oxygen exists, and the secondary reaction of carbon dioxide decomposition tends to produce lower temperatures over a broader zone above the combustion area.

Such a coke tends to cause a loss in bed height with the attendant ills of oxidized iron, low temperatures, and slow melting rates. Hence, the answer that comes quickest to mind is—avoid its use. However, that does not help solve your problem, especially when there is not any too much coke available. One solution might be to increase the amount used in the coke splits to say 375 pounds, and observe the effect. Another procedure might be to alternate the coke splits by using one of coke *A* followed by one of coke *B*. In all cases we advise the use of coke *B* or the hard coke for the bed. You do not mention whether you receive coke *A* regularly and have to use it, or whether you just happened to get one or two carloads which must be used. These factors, of course, will influence the plan to follow.

With reference to the burning out, and the necessity of using more limestone with one coke than the other, we wonder if you are considering the wrong solution. In other words the reason for greater burn-out is due to use of the stone rather than to the type of coke. Assuming that the amount of rust, sand and dirt going in with the iron charge is approximately the same at all times, the only other source of material of that nature would be the ash in the coke. If that is not higher in coke *A* than in *B*, there is no need to use more stone. Our opinion is that the extra stone having no material to combine with, reacts with the lining to meet its silica requirement to form slag. If you believe that your slag volume should increase, try adding sand in the charge to build up the quantity of slag, and save the lining.

Operating Speed for Blower

Q.—We have lined our cupola to 32 inches inside diameter and now have installed a No. 8 fan. We would like to know at what speed to operate the fan to obtain the proper air pressure.

A.—According to published data a cupola lined to 32 inches should melt between 3 and 5 tons per hour or 100 to 167 pounds per minute. Don Reese, well known cupola expert, states that 1300 cubic feet of air per minute is required to melt 100 pounds of iron in the same time. Consequently, your cupola will have to be supplied with 1300 to 2171 cubic feet per minute. Since your delivery pipe will not be absolutely tight and probably will have some bends, an allowance of 10 per cent should be made for leakage, and as a result the fan will have to supply in round numbers 1450 to 2390 cubic feet per minute. Information from the manufacturer's catalog indicates that the fan mentioned supplies about 0.768 cubic feet per revolution. Therefore, the speed of the fan should be 1890 revolutions per minute to supply 1450 cubic feet of air, and 3100 revolutions per minute to supply 2390 cubic feet of air. Our suggestion would be to operate at 3100 revolutions per minute, using a blast gate in the delivery pipe near the cupola to control the flow into that unit.

GANGWAY!

By J. A. Patterson

"All right, Junior—mother isn't going to bring you to work with her any more if you don't stop making faces at the foreman!"

Leak Developed in Boiler Section

Q.—We are enclosing a drawing and also are forwarding two pieces of iron taken from a scrap boiler section, showing a defective or leaky area. The 2500-pound charges melted in a cupola lined to 66 inches are made up of 500 pounds pig iron, 1300 pounds foreign scrap and 700 pounds shop scrap, with 400 pounds coke and 90 pounds limestone. Ferro-silicon is added where necessary. Analysis of iron in the casting shows: Total carbon 3.28 per cent, silicon 2.25 per cent, phosphorus 0.45 per cent, manganese 0.55 per cent, sulphur 0.11 per cent. Casting is gated at one end through a long runner and a number of small flat gates.

A.—Judging by the appearance of the general face of the casting your sand is satisfactory in permeability, refractoriness and moisture content. It may be that the drag molds rest too tightly on the bottom plates, or without plates, on a hard, smooth concrete floor. Vent passages should be provided under the drag. The defective area on the boiler section casting is caused by a slushy compound of iron, slag and sand which floated a certain distance and then is stuck in the corner of the small square pocket. This slushy compound was developed through lack of adequate venting in the lower part of the mold in the pockets between the ribs. The boiling iron loosened some of the sand in the vicinity—the ragged spots are plainly visible—and the combination of iron, slag, sand and steam floated while the iron was flowing rapidly, but became anchored when the stream turned a corner and lost velocity.

Percentage Is Not Truly Reliable

Q.—Where may we obtain a graph or table of figures indicating percentage of furnaces in blast for the past quarter century?

A.—We assume that you are referring to blast furnaces. Since 1942, compilation and publication of statistics on number of active and idle blast furnaces has been on an annual basis only, and figures are available from the American Iron & Steel Institute, 350 Fifth avenue, New York. For 1941 and prior years monthly data may be had from various technical publications, including *Steel,* Penton Publishing Co., Cleveland.

In the event that we have misinterpreted your inquiry, and that you are seeking statistics on the percentage of foundry cupolas in blast over a period of 25 years, the answer is that there ain't no such animal. So far as we know, no person ever compiled statistics on that particular phase, for the simple reason that the information would be of no earthly use to the compiler or to any other person. Foundry cupolas range in size from 18 to 90 inches inside diameter and from ½ to 30 tons per hour melting capacity. Some cupolas are in blast for an hour or less. Others run continuously all day. Any percentage figure on the number of furnaces active and idle would form a totally unreliable base on which to estimate the condition or the fluctuation in casting production.

For purpose of illustration consider an exaggerated but possible example. In a given group of 100 cupolas, 99 melt 1 ton each per day, 250 tons per year, or a total of 24,750 tons per year. The remaining member of the group melts 300 tons per day, or a total of 75,000 tons per year. If one cupola is idle for a year, it would be listed as 1 per cent of the total number, irrespective of whether it was one of the little ones, or the single large cupola melting more than all the others combined. Another feature that would stymie the percentage report, is the well known fact that many foundries have two or more cupolas. In a 2-cupola shop, either one can and does supply all the metal required for the daily heat. Therefore one of the pair is idle. On a percentage basis the report would show 50 per cent inactive, when in reality the shop may be working to capacity.

Gas Content Spoils Copper Castings

Q.—We have a contract for some copper alloy castings containing 1 to 2 per cent tin and 0.01 per cent phosphorus. However, we tried to make a few sample castings and could not seem to get the gas out of the metal. We melt in crucibles with oil. Castings weigh about 70 pounds with a ⅜-inch wall thickness and are cored. What would be the proper pouring temperature?

A.—As you have found out by practical experience, copper has a strong affinity for gases. Hence, considerable care must be taken to see that melting conditions are such as to provide an atmosphere wherein the gases of combustion are neutral or slightly oxidizing. Consequently, the first item to consider is adjustment of your furnace burners to secure complete combustion of the oil. Without gas analysis equipment to determine the composition of the furnace atmosphere, the adjustment must proceed by guess and by gosh. The only suggestions we can make are to see that the flame is short and sharp as opposed to long and yellow, and that the melting time is as short as possible. One authority claims that if the flame is on the reducing side a deposit of carbon will be made on a piece of cold zinc held in the flame, and if on the oxidizing side (the desired condition), the zinc will remain clean.

In England some foundrymen insure oxidizing conditions during melting by placing a small amount of manganese ore in the bottom of the crucible and the charge on top of that. In this country some have found that the addition of a small amount of copper oxide (about 4 ounces per 100 pounds) followed by the regular addition of phosphor-copper gives good results. Recent work in England indicates that use of 1 per cent of a mixture of half copper oxide and half potassium nitrate added about 5 minutes before pouring is effective in removing gases. Numerous proprietary materials on the market also are said to be used successfully. Those may contain such elements as calcium, boron, lithium, manganese, etc.

THE FOUNDRY Index Ready

The index to Volume 72 of THE FOUNDRY, *covering the 12 issues of 1944, is ready for distribution. Copies are available to subscribers on request.*

Substitution Needs Careful Consideration

Q.—We manufacture farm implements and have difficulty in obtaining malleable iron castings. It has been suggested that we use our present cupola equipment to produce a high test gray iron as a substitute employing 75 per cent steel scrap with nickel and silicon additions in the ladle. We would like to know how that iron will compare with malleable cast iron in tensile strength, ductility and elongation. What mixture and coke splits should be used in a 42-inch cupola, and how much silicon and other alloys should be added to a 50-pound ladle of iron? Will any annealing be necessary; if so how long and at what heat?

A.—While with some practice you can develop a procedure for producing a high test or tensile strength gray cast iron, we advise extreme caution in substituting that material for malleable cast iron without careful investigation of the service conditions to which it will be subjected. Alloy gray irons can be made with a tensile strength of 50,000 pounds per square inch and higher, but its ductility as measured by elongation and reduction of area is practically nil.

In producing a high test alloy iron careful attention must be given to cupola operation. According to Reese the coke splits for your 42-inch cupola should weigh 100 pounds, and the iron charges 850 pounds. To employ 75 per cent steel scrap in that mixture you would use 640 pounds with 160 pounds of silvery pig containing 8 per cent silicon. In addition to obtain a final silicon content of around 2.25 per cent you would have to add 7 pounds of 80 per cent ferrosilicon preferably to the metal emerging from the spout, or as you indicate —in the ladle. With a 50-pound ladle that would mean 7 ounces. Other requirements for the high test iron will be nickel about 1.5 per cent; molybdenum about 0.50 per cent, and chromium about 0.7 per cent. Since nickel and molybdenum do not oxidize, they can be added in the cupola with excellent recovery. If nickel shot is used you will need about 14 pounds to obtain the desired 1.5 per cent in the iron. To get the 0.50 per cent molybdenum, use 7 pounds of ferromolybdenum to the 850-pound charge.

If you were not adding 7 ounces of

(*Concluded on page* 108)

☆ ☆ *Nickel*

ASSURES CONSISTENTLY BETTER CASTINGS

Large or small . . . for all castings in which your customers demand improved physical properties, increased pressure requirements or greater wear resistance . . . Nickel will help you satisfy these demands.

Nickel also serves as a valuable tool within the foundry itself by alleviating such problems as porosity, shrinkage, chilled corners and edges and non-uniformity in castings of irregular section or unusual design.

Suitable forms of Nickel and Nickel alloys have been developed to simplify its use by both ferrous and non-ferrous foundrymen.

★

Our technical staff and the casting specialists of our distributors have had many years of experience with foundry problems. They will welcome the opportunity to cooperate with you.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

(*Concluded from page* 106)

ferrosilicon to the 50-pound ladle of iron we would suggest adding the ferrochromium to it. However, the addition of a further 8 ounces (9 pounds per charge) of cold material might result in unsatisfactory solution of the ferrochromium, or too great a loss in temperature. An iron of the composition given could be heat treated to obtain varying physical properties, but without definite information on what is desired, there is little more that can be offered along that line. In general it might be said to heat to around 1750 degrees Fahr. for several hours, quench in oil, and reheat to 1250 degrees Fahr., and allow to cool slowly.

Desires Information On Special Steel

Q.—Can you supply us with information on the copper-silicon steel developed by Ford Motor Co., and what equipment is needed for its production as well as the mixture melted?

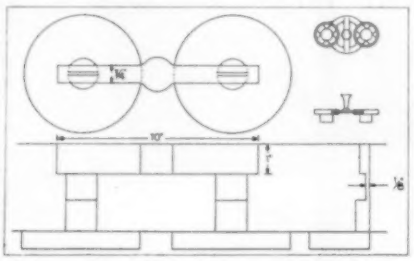
A.—We understand that several variations of copper-silicon steel are being used, and depend upon the type of castings into which the alloy is poured. One for brake drums is given as containing 1.5 per cent total carbon, 1 per cent silicon, 0.8 per cent manganese, and 2 per cent copper. One for crankshafts contains 1.5 per cent total carbon, 1.0 per cent silicon, 0.7 per cent manganese, 2.0 per cent copper and 0.5 per cent chromium. One for pistons shows 1.5 per cent total carbon, 1.0 per cent silicon, 0.8 per cent manganese, and 3.0 per cent copper.

Available information indicates that the alloy is made from 40 to 50 per cent steel scrap, return or back scrap, pig iron and the necessary alloys. It can be produced in the electric furnace, rotary fuel fired furnace, air furnace, or by duplexing with cupola and air furnace. As-cast the alloy is somewhat akin to white iron. Heat treatment for the brake drum alloy is to heat at 1650 degrees Fahr. for 30 minutes; rapidly cool to 1450 degrees; cool in 2½ hours to 1340 degrees, and then air cool. For the other two the heat treatment is to heat to 1650 degrees Fahr. for 30 minutes; air cool to 1200 degrees Fahr.; reheat to 1380 degrees and hold 1 hour; cool in 1 hour to 1000 degrees, and air cool.

Small Castings Are Defective on Top

Q.—We are forwarding a sample of the defective area in a small gray iron wheel 6 inches diameter with a hub 2 inches diameter and 1½ inches deep. Patterns are mounted in pairs and gated as shown in the accompanying illustration. The mold is made on a jolt squeeze machine. The defect shows up sometimes as a single hole and sometimes as a number of holes, and is not confined to any one part of the casting. The metal with a silicon content of 2.35 per cent is skimmed as it leaves the hand ladle. We work the sand as dry as possible and have tried a variety of methods for venting the mold. Recently we have made castings in a very open sand with a permeability of 90, but without success.

A.—The defect in the casting submitted for examination was caused by a mold that would not allow the metal to lie quietly. Since you claim that the sand was worked as dry as possible and since the sand showed the comparatively high permeability of 90, only one variable factor remains. The sand was rammed too hard. Possibly the drag is too shallow for the job and as a result the sand immediately around the bottom of the hub was rammed to a greater density than the remainder. A possibility exists that all the sand in the drag was too hard. Rearrange the squeeze head with a cup over the hub so that this portion of the sand will not be rammed harder than



Improved method of gating castings, compared with method shown in upper right corner

the sand over the other part of the pattern.

Commotion in the iron produces a slushy compound which traps some of the steam and then floats on the metal either to the top or to any part of the side wall where it becomes anchored. The following metal flows all around it and the slushy material does not appear until the skin is removed in the machining operation. While looking for a possible cause of the trouble, you might note whether the bottom board is squeezed down on the drag by the machine, or is placed on the drag after the sand has been squeezed. In the former —and probable case—it may be advisable to remove the board temporarily and scratch a few vents in the sand and then replace the board. Incidentally you can avoid practically all hazard on a casting of this kind by molding it in the opposite position, that is with the hub in the cope. Incidentally also, a considerable saving in metal will result from a change in the type of gate as shown in the accompanying illustration.

Increase Chill in Mine Car Wheel

Q.—We are making mine car wheels 14-inch diameter, 4-inch face which require a chill depth of at least ⅜-inch on the tread. Our cupola mixture is 80 per cent machinery scrap and 20 per cent mild steel. The chill on the wheels is only ¼-inch deep. The chill rings are 4 inches thick. We cannot get any car wheel scrap. In the event we can get car wheel scrap what amount should be used in the cupola charge?

A.—Although the analysis and composition of small chilled wheels are not adhered to as rigidly as they are in the standard chilled car wheels employed in railroad service, these factors must be held within certain limits. The analysis governs the depth of chill on the tread, and the composition governs the ability of the iron to prevent the wheel from cracking during the cooling period. Usually a suitable composition represents a compromise. Since your only available material is machinery scrap and steel, we fear you will have some difficulty in producing uniform wheels.

Average analysis of machinery scrap shows 2.00 to 2.25 per cent silicon, but you may run into a batch varying widely from this average. Silicon content of the steel is negligible. Suitable analysis for small wheels shows: Total carbon 3.25 per cent; silicon 0.80 per cent, manganese 0.75 per cent, phosphorus 0.30 per cent, sulphur under 0.10 per cent. A direct answer to your question on how to increase the depth of chill, is to reduce the silicon content by increasing the amount of steel in the charge. If and when car wheel scrap is available, a suggested charge might contain 60 percent machinery scrap, 30 per cent car wheel scrap and 10 per cent steel.

Molding Methods for Making Bushings

Q.—Can you advise us on the best method for making bronze bushings in quantity lots? We are having trouble in making a bushing 4 inches outside, 2⅝ inches inside diameter and 13½ inches long. Pattern is plated flat with half on each side of the pattern plate and shrink bobs are located on the spruc. Casting is good except we get a bow or low spot on the inside at about the center of the bushing. Cores are made on an extrusion machine in accordance with manufacturer's recommendation. Core has a 7/16-inch round rod in square hole in the core, and the rod is still straight after being used. Mold is tilted slightly when metal is poured. Core prints are 2 inches long on each end.

A.—Your pattern equipment appears to be excellent for rapid production of molds, and the cores should be satisfactory. For 2⅝-inch cores there is no need of a rod unless the wall thickness of the casting is much greater than mentioned. However, shrinkage occurring in metals and alloys requires a provision for necessary feeding. That is accomplished by a proper riser located at the high end of the molds between the two bushings with adequate gates between the riser and the castings to insure sufficient feed.

Usually in mass production of bushings the gating system consists of a downsprue which is gated into the base of the riser. Gates from the riser lead the metal into the casting cavities. Molds usually are set level on the floor until they are poured, and then the gate and riser end of the mold is lifted during freezing to increase the head.

Today

Castings, ferrous and nonferrous—more and sounder castings—are urgently needed to win the war. Sand conditioned by a Royer helps speed Victory by cutting discount, improving casting quality, and reducing labor drudgery.

Over 6,300 foundries, including that of the D. T. Williams Valve Co., Cincinnati, Ohio, (pictured) use Royers.

Tomorrow

Post-war competition will demand maximum production economies—the reduction of discount losses to a very minimum. Royer conditioned sand minimizes blows, runouts, scabs, drops, skids and surface inclusions. Smoother casting surfaces result which reduce cleaning time. Profitable operation starts with properly conditioned sand and only the Royer provides these six essential steps to thorough sand preparation.

1. The elimination of sand contamination
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There is a Royer model and size for every foundry requirement. Let us send new Catalog 744 showing typical foundry installations.

THE ROYER FOUNDRY & MACHINE CO.
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FOREMOST IN SAND CONDITIONING EQUIPMENT

MEN ... of Industry

FRANKLIN R. HOADLEY, recently president of the Atwood Machine Co., Stonington, Conn., has been made president of Farrel-Birmingham Co. Inc., Ansonia, Conn., which has acquired the former company. Mr. Hoadley was vice president of Farrel-Birmingham Co. from 1930 to 1937, when the resigned to become president of Atwood Machine Co. He was graduated from Yale university and became associated with Farrel Foundry & Machine Co., Ansonia, in 1914, as an apprentice. Following war service, he was re-employed by the Farrel company as foundry manager in 1919, was elected a director in 1923, and following the merger with Birmingham Iron Foundry Co., Derby, Conn., in 1927, he became a director of the newly-formed Farrel-Birmingham Foundry & Machine Co. Inc. Mr. Hoadley is a past president of both the National Founders Association and the Gray Iron Founders' Society.

♦ ♦ ♦

Glenn H. Barnes, for the past year director of the chemical and metallurgical laboratories, Richmond Radiator Co., Uniontown, Pa., has been appointed to the engineering staff of Great Lakes Foundry Sand Co., Detroit. Mr. Barnes spent several years pioneering the use of clay for rebonding foundry sands, following which he was general superintendent, Warden-King Ltd., Montreal. For 11 years he owned and operated a foundry sand company in Brantford, Ont.

♦ ♦ ♦

R. L. Heath has been appointed metallurgical engineer for Climax Molybdenum Co., New York, with headquarters in St. Louis. Mr. Heath was formerly chief metallurgist of the Allison Division, General Motors Corp., Indianapolis. He is an active member of the American Society for Metals and Society of Automotive Engineers.

♦ ♦ ♦

Merton A. Hosmer, recently elected president of the New England Foundrymen's Association, is assistant metallurgist, Hunt-Spiller Mfg. Corp., Boston. A native of Concord, Mass., Mr. Hosmer attended Northeastern University and following his graduation from Tufts College in 1919, he was appointed chemist at Hunt-Spiller Mfg. Corp. In 1942 he was made assistant metallurgist.

♦ ♦ ♦

E. F. Thum Jr., formerly assistant to the foundry manager and the chief estimator at Eclipse-Pioneer Foundries, Teterboro, N. J., has returned to the Abrasive Alloy Castings Co., Bridgeboro, N. J., as vice president and general manager.

♦ ♦ ♦

Sara E. Southall, supervisor of employment and service, International Harvester Co., Chicago, has received the first "Award of Merit" given by the National Association of Personnel Directors.

♦ ♦ ♦

Arthur L. LaMasters, chief engineer, Claude S. Gordon Co., Chicago, has resigned to become vice president in charge of operations, Alloy Casting Co., Champaign, Ill., engineers and manufacturers of heat and corrosion resistant castings and furnace mechanism. Mr. LaMasters has had many years experience in the metallurgical field, having been responsible for equippiing, laying out and installing some of the largest and most modern heat treating departments required for production of war materials.

♦ ♦ ♦

Paul Pierce has been appointed superintendent of No. 3 foundry, Continental Foundry & Machine Co., East Chicago, Ind., succeeding the late William H. Parker. **John W. Johnson** has been named to succeed Mr. Pierce as superintendent of No. 1 foundry's hull and turret department. Mr. Johnson, formerly superintendent of No. 1 foundry, has been succeeded by **Frank Soderstrom,** and **James Murray** has taken over Mr. Soderstrom's duties as general foreman in No. 1 foundry.

♦ ♦ ♦

Alexander Gobus has been elected vice president and chief metallurgist, Sam Tour & Co. Inc., New York, in charge of plant control of materials and processes, heat treating, metallography, radiography and related sciences. **Charles Davidoff** has been elected vice president and chemical engineer and will specialize in precision casting, electrochemistry, metals finishing, corrosion problems and plastics. **Dr. E. I. Valyi,** formerly vice president, and **Fred J. Tobias,** formerly production engineer, are no longer associated with the company.

♦ ♦ ♦

Roy J. Harrison has succeeded his father, the late Joseph W. Harrison, as president of the Harrison Steel Castings Co., Attica, Ind. Roy J. Harrison was formerly vice president and continues in charge of manufacturing. **Glen W. Harrison,** recently secretary, has been

(*Continued on page* 112)

FRANKLIN R. HOADLEY

GLENN H. BARNES

R. L. HEATH

MERTON A. HOSMER

WOODWARD IRON

Ideally adapted to all types of castings where

UNIFORMITY

is essential.

WOODWARD IRON COMPANY

WOODWARD, ALABAMA

Independent Since 1883

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(*Continued from page* 110)

made vice president in charge of sales. **Wade C. Harrison,** previously treasurer, now is secretary and treasurer, continuing in charge of purchases. **George C. Dickey,** formerly general superintendent, now is works manager, and **F. M. Hatton** is sales manager.

Various other changes in operating officials at Harrison Steel Castings Co. also have been made, the staff now including: **Amos Crow,** general superintendent of foundry; **B. A. Lawson,** superintendent of metals and research; **Glen Walter,** superintendent of maintenance and engineering; **S. B. Leath,** superintendent of patterns and pattern design; **L. D. Kirkman,** acting foundry superintendent; **C. D. Greenman,** superintendent of cleaning room; **F. C. Fisher,** chief inspector; **C. C. Daugherty,** traffic and billing manager; **W. E. Albert,** purchasing agent; **Jessie Coen,** auditor; **H. J. Smith,** assistant to the treasurer, and **J. G. Steinbaugh,** personnel manager.

♦ ♦ ♦

H. A. Steinbrink has been appointed works manager of Century Foundry, a division of Century Electric Co., St. Louis. Until recently, Mr. Steinbrink had been connected with Gunite Foundries Corp., Rockford, Ill. He has specialized in foundry sands and cupola research.

♦ ♦ ♦

Clinton R. Hanna, inventor of the tank-gun stabilizer, and manager of the electro-mechanical department of the Westinghouse Electric & Mfg. Co.'s research laboratories, has been appointed an associate director of the Westinghouse research laboratories.

♦ ♦ ♦

Delos R. Hay, recently vice president, has been elected president and treasurer, A. T. Wagner Co., Detroit, succeeding the late T. W. Kirby. Mr. Hay has been associated with the company for 20 years. A graduate of Cornell university, he was for many years foundry superintendent, Riley Stoker Co., Worcester, Mass., and prior to that connection was associated with Allis-Chalmers Mfg. Co., Milwaukee. **U. S. Bratton Jr.** will assist Mr. Hay as vice president and secretary of the company.

♦ ♦ ♦

L. E. MacFadyen has been named works manager, Taylor-Wharton Iron & Steel Co., Easton, Pa., in charge of the company's High Bridge, N. J., plant, of which he was superintendent for 4 years, and of the Easton plant, where he has been superintendent for the past year. Mr. MacFadyen has been with the company since 1922. **James M. Sandt** succeeds Mr. MacFadyen as superintendent of the plant at Easton. **E. O. Swearingen** continues as superintendent of the High Bridge plant.

♦ ♦ ♦

Perry C. McCollom has been appointed director of research, American Crucible Co., Shelton, Conn. Mr. McCollom

PERRY C. McCOLLOM

was graduated from the School of Ceramic Engineering, University of Illinois, and was in the laboratory of Metal & Thermit Corp., Carteret, N. J., for several years. In recent years he has been head, research laboratory, New Castle Refractories Co., New Castle, Pa.

♦ ♦ ♦

C. O. Kleinsmith has been elected a vice president of National Carbon Co. Inc., a unit of Union Carbide & Carbon Corp., New York. Mr. Kleinsmith joined the company in 1919 and was sales manager for the eastern United States until his appointment as general sales manager for Eveready products, 2 years ago. **D. B. Joy,** product manager for the past year, has been appointed general sales manager for carbon products. Mr. Joy, a graduate of Massachusetts Institute of Technology, became associated with National Carbon in 1923, was made director of the Process Engineering Laboratory, Fostoria, O., 10 years ago, and in 1941 was appointed assistant superintendent of the factory there. **R. P. Bergan** has been made general sales manager for consumer and related products.

♦ ♦ ♦

George C. Kohl has been appointed to the newly created position of chief permanent mold engineer, casting division, Aluminum Co. of America, Pittsburgh. **Warren Van R. Gilbert** succeeds Mr. Kohl as manager of the aluminum permanent mold plant, Cleveland. **F. C. Seeger** has been named to take over Mr. Gilbert's duties as works manager of the Monroe, Mich., plant. **Sanford H. Bennett** has been appointed works manager of the Canonsburg, Pa., works, to fill the position vacated by Mr. Seeger, and **A. E. Codney** succeeds Mr. Bennett as superintendent of the Canonsburg forge shop.

♦ ♦ ♦

H. F. Henriques, formerly sales manager of the north central division, Air Reduction, New York, has been appointed general sales manager. **J. J. Lincoln,** until recently sales manager of the south central division, has been appointed director of sales services. **C. M. Bloodgood,** who has been sales manager of the Pacific coast division, has been named assistant to the vice president in charge of sales. The new appointees will have offices at 60 East 42nd street, New York. **H. P. Etter,** previously manager of the Los Angeles district, has been appointed sales manager of the Pacific coast division, with headquarters in San Francisco.

♦ ♦ ♦

Milton P. Higgins has been appointed a vice president of Norton Co., Worcester, Mass. In addition to his new du-

(*Continued on page* 178)

H. A. STEINBRINK

CLINTON R. HANNA

DELOS R. HAY

L. E. MacFADYEN

THE LAST *DROP* IS AS GOOD AS THE FIRST

Ask the Men Who Use It!

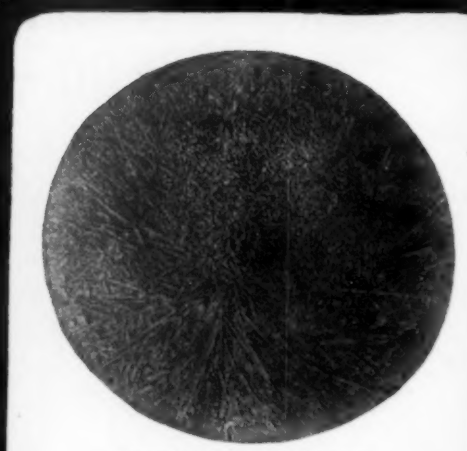
LIKE 2 PEAS IN A POD!

The UNIFORMITY and unvarying quality of DAYTON OILS are like two peas in a pod! The last drop is as good as the first . . . and every drop works clean in the core boxes. DAYTON OIL produces GOOD CORES . . . efficiently and economically. ASK one of your Foundry friends . . . he's probably using DAYTON OIL!

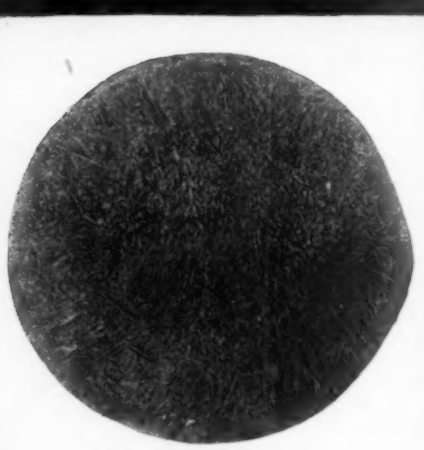
The DAYTON OIL COMPANY

DAYTON 1, OHIO

STEEL CORE AND MOLD WASHES - BINDER AND CORE PASTE - CORE WASHES - CHILL COATINGS



Steel without Boron.



With .003% Boron.

BORON

has highly useful effects in STEEL CASTINGS

Some of the beneficial effects of Boron on the hardenability and strength of both iron and steel castings were definitely learned many months ago. More recently, its favorable effect on machining quality has become known. Now a quite special but interesting and valuable use has been found in the manufacture of certain pressure castings.

In valves and fittings, for example, voids caused by large dendritic formations are a serious defect. The metallic structure must be dense and uniform, to make sure that no seepage of gas or liquid under pressure will occur. With Boron added in the amount of .003%, the cast metal is found to solidify with much less dendritic pattern and more satisfactory results are obtained.

The two specimens compared above show the structural difference mentioned.

Inquiries concerning any use of Molybdenum, Tungsten, or Boron will be welcomed by the Molybdenum Corporation.

AMERICAN Production, American Distribution, American Control—Completely Integrated.
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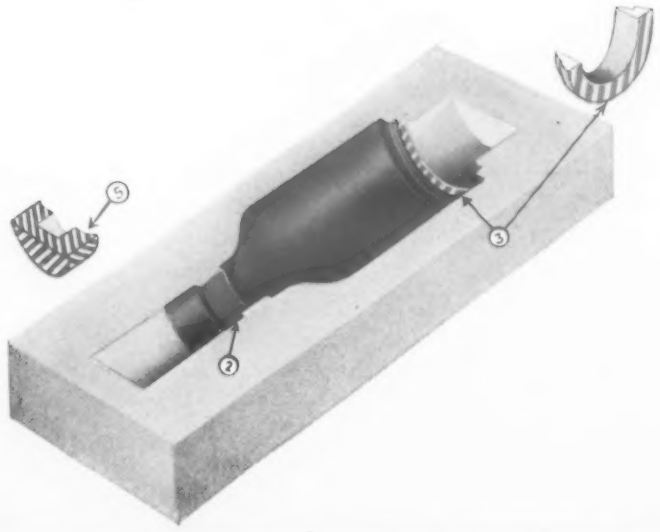
MOLYBDENUM CORPORATION OF AMERICA
GRANT BUILDING PITTSBURGH, PA.

MCA



STANDARD PATTERN COLORS

COLOR markings, shown opposite, are recommended as standard by the producers and users for foundry patterns and core boxes of wood construction.

These recommendations were promulgated by a Joint Committee of the American Foundrymen's Association, American Society for Testing Materials, Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers, Steel Founders' Society of America, National Association of Pattern Manufacturers, Malleable Iron Research Institute, and Foundry Equipment Manufacturers' Association.

The standards were reviewed by a committee under the direction of the Department of Commerce, Bureau of Standards, and approved as U. S. Department of Commerce Commercial Standard CS 19-30 (Effective date Feb. 10, 1930). They were also approved as American Recommended Practice B45.1-1932 under the Procedure of the American Standards Association.

Key to Standard Color Markings for Wood Patterns and Core Boxes

All foundry patterns and core boxes of wood construction shall be painted in accordance with the following practice which is shown on the opposite color chart:

(1) Surfaces to be left UNFINISHED are to be painted BLACK.

(2) Surfaces to be MACHINED are to be painted RED.

(3) Seats of and for LOOSE PIECES are to be marked by RED STRIPES on YELLOW BACKGROUND.

(4) CORE PRINTS and SEATS for LOOSE CORE PRINTS are to be painted YELLOW.

(5) STOP-OFFS are to be indicated by DIAGONAL BLACK STRIPES on a YELLOW BASE.

Some variations in shades of above colors are permissible within reasonable limitations.

PATTERN SHRINKAGE ALLOWANCES

Source: Cast Metals Handbook, American Foundrymen's Association.

Casting Alloys	Pattern Dimension	Type of Construction	Section Thickness, Inches	Contraction, In. per Ft.
Gray Cast Iron[1]	Up to 24 in.	Open Construction		1/8
	From 25 to 48 in.	Open Construction		1/10
	Over 48 in.	Open Construction		1/12
	Up to 24 in.	Cored Construction		1/8
	From 25 to 36 in.	Cored Construction		1/10
	Over 36 in.	Cored Construction		1/12
Cast Steel[2]	Up to 24 in.	Open Construction		1/4
	From 25 to 72 in.	Open Construction		3/16
	Over 72 in.	Open Construction		5/32
	Up to 18 in.	Cored Construction		1/4
	From 19 to 48 in.	Cored Construction		3/16
	From 49 to 66 in.	Cored Construction		5/32
	Over 66 in.	Cored Construction		1/8
Malleable Cast Iron[3]			1/16	11/64[4]
			1/8	5/32
			3/16	19/128
			1/4	9/64
			3/8	1/8
			1/2	7/64
			5/8	3/32
			3/4	5/64
			7/8	3/64
			1	1/32
Aluminum	Up to 48 in.	Open Construction		5/32
	49 to 72 in.	Open Construction		9/64
	Over 72 in.	Open Construction		1/8
	Up to 24 in.	Cored Construction		5/32
	Over 48 in.	Cored Construction		9/64 to 1/8
	From 25 to 48 in.	Cored Construction		1/8 to 1/16
Magnesium	Up to 48 in.	Open Construction		11/16
	Over 48 in.	Open Construction		5/32
	Up to 24 in.	Cored Construction		5/32
	Over 24 in.	Cored Construction		5/32 to 1/8
Brass				3/16
Bronze				1/8 to 1/4

(Before Specifying Consult the Patternmaker and Foundryman)

EXPLANATORY NOTES

1—A standard patternmaker's shrinkage for common gray cast iron is ⅛ inch per foot. For higher strength irons (those of 40,000 pounds per square inch tensile strength and over) and for white cast iron, the shrinkage allowance averages 5/32-inch per foot. Allowances given in table are quoted from "Specifications for Wood Patterns," formulated by a special committee of the Milwaukee branch, National Metal Trades Association, and published as A.F.A. Preprint 32-1 (1932).

2—The shrinkage allowances for cast steel may vary somewhat according to the design of the casting, pouring temperature of the metal, restraint of projecting lugs, cores, whether cast in green or dry sand, etc., and should be verified by the producing foundry. Allowances given in the table are quoted from "Specifications for Wood Patterns" formulated by a special committee of the Milwaukee branch, National Metal Trades Association and published by the A.F.A. as Preprint 32-1 (1932).

3—The values given under malleable cast iron are the average results of shrinkage tests conducted by seven foundries on rectangular, 15x1½-inch bars with various thicknesses and are reported by the Malleable Iron Research Institute, Cleveland.

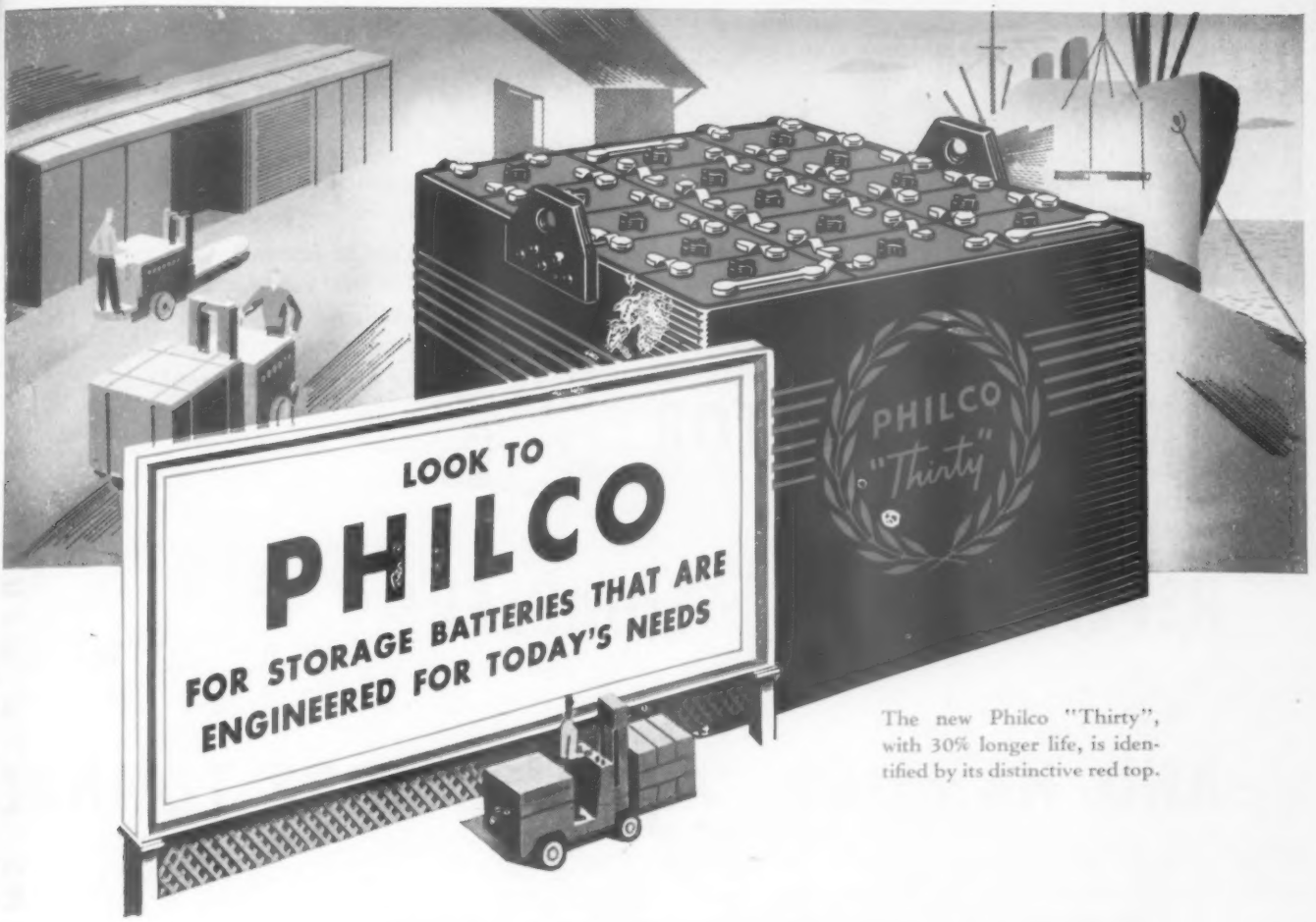
4—Contraction results reported in the table are net contraction values, that is, the original white iron casting, which shrinks ¼-inch per foot when cast, expands ⅛-inch during the anneal, resulting in a net contraction of ⅛-inch.

5—Patternmaker's shrinkage for malleable cast iron customarily is figured at from ⅛ to 3/16-inch per foot. Factors which must be taken into consideration are:

(1) Thickness of section—Net contraction of a casting ¼-inch thick is greater than that of a casting ¾-inch thick.

(2) Length of casting—the net contraction of a casting 5 inches long is greater than that of a casting 20 inches long.

(3) Carbon content—the net contraction of a low carbon casting is somewhat greater than that of a high carbon casting. In uniform, standard-quality malleable cast iron, there will be insufficient variation in the carbon content to require consideration of this factor.



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Consistently through the years, users of PHILCO Storage Batteries—both motive power and stationary types—have been *first* to get the major developments contributing to high capacity, greater efficiency, longer life, lower cost. Newest Philco *first* in industrial storage battery engineering is the new Philco "Thirty" with *30% longer life*—now available in certain types and limited quantities for electric industrial trucks. Catalogs of this and other modern Philco Batteries for your special needs will gladly be sent on request.

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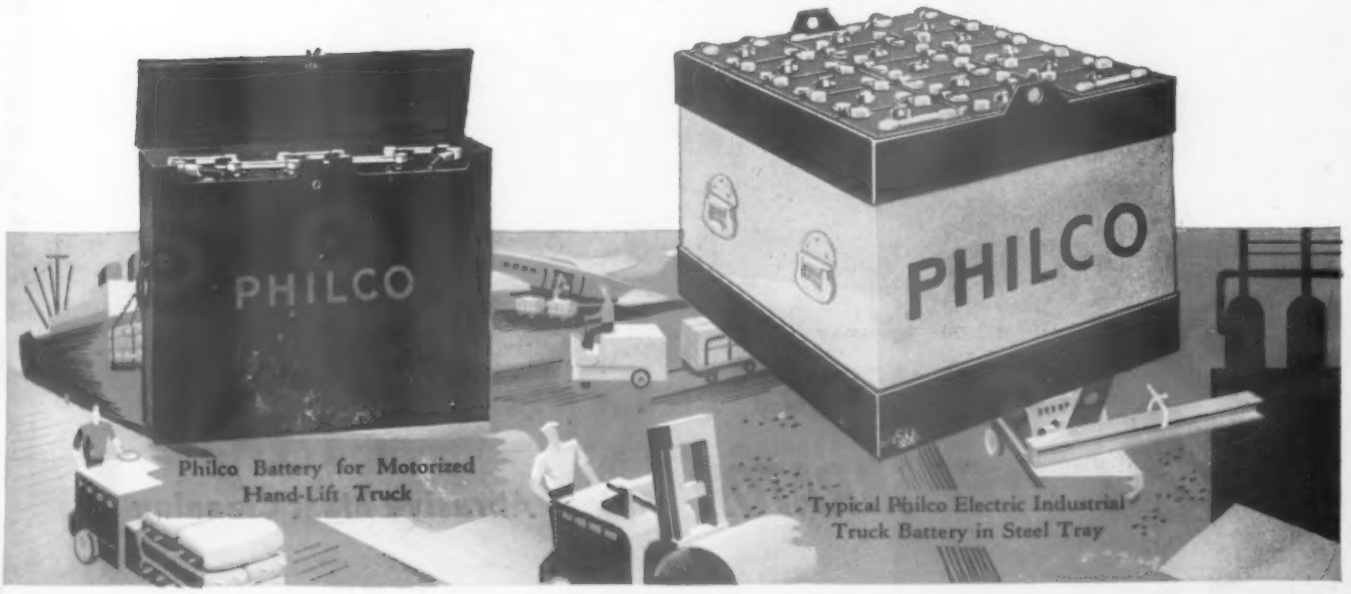
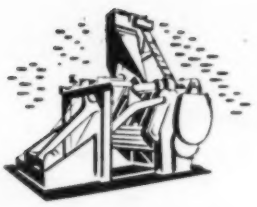


Philco Battery for Motorized Hand-Lift Truck

Typical Philco Electric Industrial Truck Battery in Steel Tray

1 WHEELABRATOR



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AND HANDLED 40% MORE TONNAG

WHEELABRATOR *Airless Abrasive Blast Cleaning*

HOW efficiently the Wheelabrator does its job is well expressed in the words of this typical user—a medium size Midwest foundry:

"Our action in installing a Wheelabrator three years ago was one of the best things that we have ever done in our plant as far as production betterment has been concerned. This machine has more than lived up to your claims for it, and has materially cut down our cost of operation.

"We replaced ten large mills which were taking the full time of three men—whereas the Wheelabrator takes but one man who easily keeps up to capacity. Then, too, we put through a larger tonnage by about 40% than we have ever put through our mill room before—and did it easily, which we know could not have possibly been done working overtime with tumbling mills.

"The Wheelabrator does a fine job and still leaves us with some excess capacity in our cleaning department. We are particularly well pleased with the nice finish we get on castings. They look as if they were aluminum instead of gray iron.

"We haven't figures to show what savings in the machine shop cost are, but the machine shop foreman tells me that his tool wear and breakage have been materially cut down and he is able to machine most items at higher speeds than he did formerly. One thing is sure and that is that you get all the sand and scale removed right down to the bare metal.

"From a cost study we have made, we found that we are saving over 2% per cwt. in cleaning with the Wheelabrator than we had over the milling, and this in spite of the fact that there had been a wage increase over the previous year of 10%."

If your cleaning operation is not functioning as smoothly as it should, or if your plans for the future require current study, be sure to investigate the Wheelabrator. Our engineers will be glad to work with you whenever you are ready.

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BRINGS YOU THESE ADVANTAGES

- HIGH-SPEED CLEANING—reduces costs; speeds up shipment of orders.
- CUTS CLEANING COSTS up to 50% and more, because: it is faster; saves power up to 80%; saves labor; saves time in loading and unloading; saves space; saves abrasive; saves on operating and maintenance costs.
- REMOVES ALL TRACE OF SAND AND SCALE down to the virgin metal, with the result that:
  - Machining and grinding are faster.
  - Tools last longer.
  - Inspection is simplified.
  - Hardness readings are accurate.
- IMPROVED APPEARANCE — Wheelabrated products are bright, silvery, and uniformly clean.
- PROVIDES PERFECT BOND for final finishing such as enameling, plating, gavanizing, painting, etc.
- PRODUCES WIDE RANGE OF FINISHES from fine to coarse.
- HANDLES WIDE RANGE OF WORK — from fine springs to heavy armor plate. Ideal for special and unusual applications.
- ELIMINATES CHIPPED AND ROUNDED CORNERS — only a minimum amount of stock need be allowed for finish machining.

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around DETROIT

BY A. H. ALLEN
Detroit Editor, The Foundry

Steps taken to ease shortage in engine parts as demand continues to climb. . . . New bulletins to cover repair welding of malleable iron and steel castings. . . . Nonferrous foundries modernizing

AMONG the most critical items in the war production with which foundries have intimate connection are various engine parts, both for original equipment and for replacement requirements. Various moves have been made in the direction of easing the supply of such castings, such as reopening of gray iron foundries in automotive plants, but until recently no direct attacks were being made on specific items on the shortage list.

Demand for engine parts still is climbing. Installed internal combustion engine horsepower in Navy ships, Army vehicles, military generator sets and filtering plants is growing astronomically, and replacement parts requirements are growing along with them. As is well known, the conventional military policy, when ordering replacement parts, is roughly as follows: If 100 pieces are needed, order 1000 and be satisfied if 500 are delivered.

Civilian engines, automotive and stationary, likewise are wearing out at an accelerated pace, and are being repaired long beyond the point where normally they would be replaced.

Cannot Measure Demand

Some attempts are being made by the WPB and related agencies to measure the extent of the rise in demand for parts on an overall basis, but the only common denominator for carburetors and magnetos, and cylinder heads and pistons is dollars, and dollar totals do not tell whether capacity to make a given part is adequate or not. On the other hand, detailed analysis of productive capacity and needs for all engine parts would require the entire census bureau tabulation equipment and a corresponding staff of analysts and schedule clerks.

By selecting a few "spot" parts for which shortages are most widely reported, it is hoped the problem may be reduced to manageable proportions. So the WPB has sent out what it calls form 4031 to internal combustion engine manufacturers, asking for a listing of casting requirements for cylinder heads and cylinder blocks, by pattern number and engine model, with the name of the foundry on which the order was placed and the monthly requirements for the first half of 1945 for production and spares. These data then will be checked against engine schedules, summarized by foundries and then turned over to the WPB's Steel Division for checking against the capacity of the foundries to determine the extent to which requirements can be met and to make recommendations as to transfer of work among foundries or expansion of foundry facilities to meet deficits.

Another approach to a specific problem was in the case of gray iron cylinder sleeves. The problem here was found to center around the major supplier, Sealed Power Corp., Muskegon, Mich., which was unable to accommodate important orders for shorter runs because it was loaded up with larger orders. Sealed Power machines sleeves cast by Campbell, Wyant & Cannon and the Centrifugal Casting Co. Although the WPB has given approval of a $35,000 expenditure by the latter company for installation of new heat treating furnace, cupola and blower, mixing ladle, etc., additional foundry capacity appeared necessary, so Ford Motor Co. was asked to reopen its closed centrifugal casting installation in the gray iron foundry for production of sleeves in large runs—4000 and up. Ford also will machine these sleeves, the idea being that this move will release some of the Western Michigan capacity to handle shorter runs of sleeves on other orders.

(Editor's Note: Later check with Ford reveals the company was approached by WPB representatives with blueprints on these sleeves for various engine builders, including Hercules, Buda, Cummins, as well as Ford of Canada. Originally it was thought they were to be steel sleeves, but after learning that they were to be gray iron and that machining also would be necessary, Ford found it impossible to accommodate the work, so at the moment the entire deal is off. The incident suggests a considerable questioning of the accuracy and timeliness of WPB press releases, from which the information originally was obtained.)

C-W-C is being asked to supply an additional quantity of rough castings for machining by the White Machine Co., Eau Claire, Wis., which has located $50,000 worth of necessary machinery from surplus stocks to boost output of sleeves by 20,000 to 40,000 monthly.

A third approach was used by the WPB with regard to bearings, working in co-operation with the Navy's engine parts co-ordinating office (EPCO) and five major bearing manufacturers—Cleveland Graphite Bronze, Detroit Aluminum & Brass Corp., Bohn Aluminum & Brass, Federal-Mogul and Moraine Products Division of General Motors. Bearing orders from engine plants at which there are WPB scheduling officers will be reconciled with requirements, at the engine plants. This should show what expansion of bearing plants may be necessary. Thus far, indications point to total need for about 18,000,000 bearings monthly for military and civilian needs, compared with production (for the five major companies) of about 12,800,000 monthly and potential production, if fully manned, of about 15,200,000.

Plant Expansions Granted

A WPB-Army-Navy committee at EPCO has the responsibility for finding new sources of supply for engine parts when necessary, either by bringing in new suppliers or recommending expansion. All requests for plant expansion for engine parts are being given prompt consideration without waiting for statistical proof that present facilities are inadequate, and the WPB Automotive Division is soliciting requests for expansion whenever there appears to be a shortage.

Manpower shortages are blamed for most of the parts shortages, although the Mead senate investigating committee which began holding sessions in Detroit Feb. 12 may find a few other interesting explanations, principally on the score of man-effort. One of the difficulties ascribed to manpower recruiting efforts is that local manpower committees sometimes fail to recognize parts manufacturers' needs for workers, because so large a part of their output cannot be identified as for "must" programs. A large volume of parts is distributed through dealers—on AA-1 ratings, except for passenger car parts—and orders from engine companies are basketed. Consideration is being given to establishing plant scheduling office—in certain of the parts plants to identify urgent orders.

Although production of heavy trucks in December fell behind original schedules by 20-25 per cent, a later program approved Dec. 19 made it appear likely

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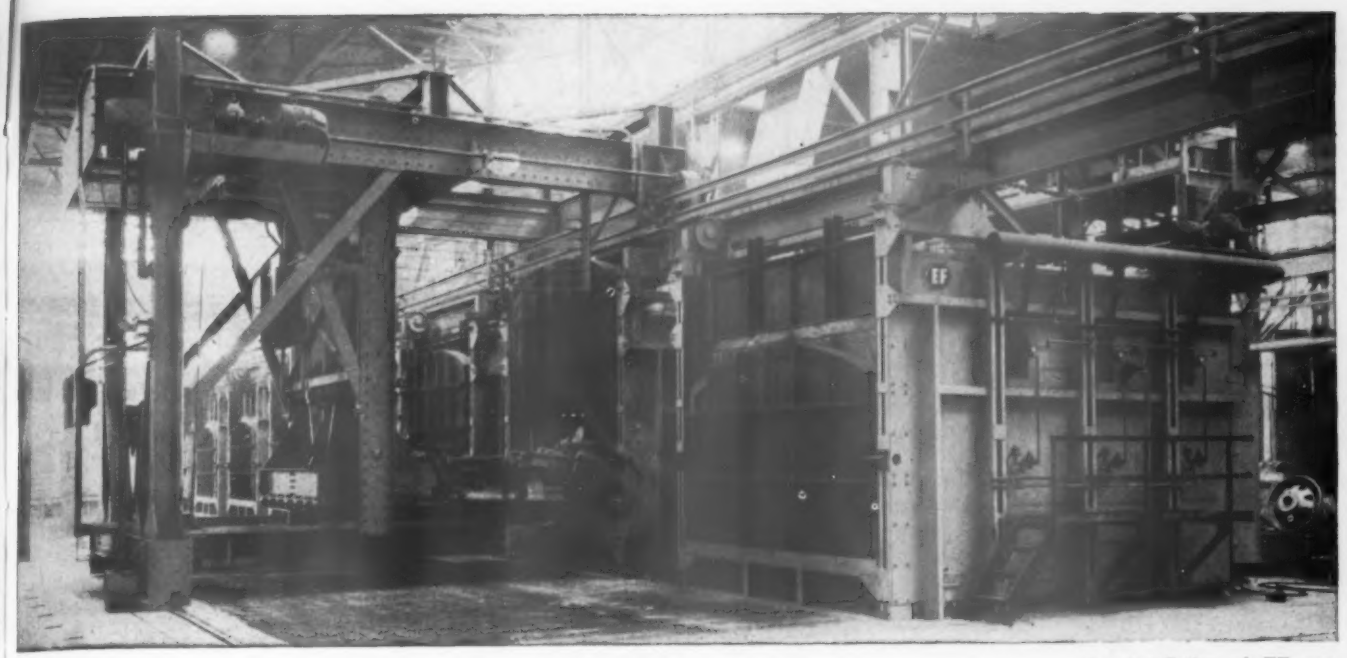

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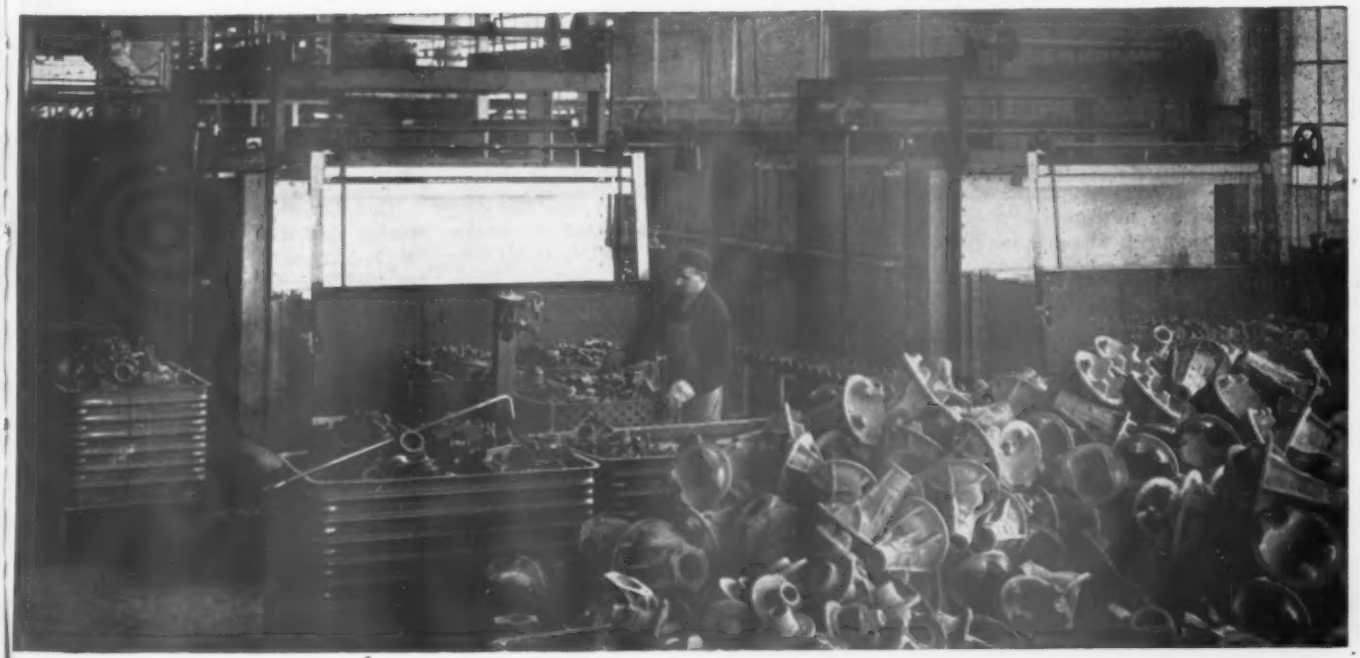


(Concluded from page 120)

trucks could be removed from the critical list. The Army must have heard this rumor, for it immediately started discussing a new and still higher program for the current year. Failure to meet original December projections on trucks was blamed primarily on labor troubles and shortages of components—engines, axles, transmissions and winches. For example, General Motors fell 15 per cent behind schedule on 2½-ton 6-wheel drive dump trucks because of failure to receive a sufficient supply of winches and White Motor had the same trouble.

Shortage of winches, in turn, was blamed on inadequate flow of some of the 150 components, particularly certain castings. Reo, also working on the 2½-ton dump truck, fell 37 per cent behind schedule because of manpower shortages, lack of transmissions, and other minor causes. Many companies complained about delays in receiving freight shipments, the result of the worst snarl in railroad freight in 30 years occasioned by protracted severe winter weather throughout the East and Middle West.

* * *

APPROVAL of Engineering Bulletin 152 covering the repair welding of gray iron castings (THE FOUNDRY for January, page 86) has greatly reduced the high scrap loss in engine block castings. One foundry alone claims the new Ordnance specifications resulted in a saving of $10,000 in a month's time because of lowered scrap. Industry representatives are reportedly asking for further examination of engineering tolerances set up by Ordnance, to determine if requirements cannot be lowered nearer to accepted commercial standards.

Bulletins covering repair welding of both malleable iron and steel castings have been compiled and are now being studied by industry representatives for revisions. They should appear in a matter of weeks.

* * *

LIVELY interest is being shown, especially among nonferrous foundries in this area, in plans for modernizing and extending present facilities. In most of these, while the modifications are readily applicable to current war production, the principal benefit will accrue in the postwar period when an accelerated volume of civilian production, beyond anything previously experienced, can be accommodated with a minimum of rearrangement of equipment. The postwar planners appear confident of a large steady volume of business, and their expansion plans in many cases run into the millions of dollars.

The feeling is prevalent that light metal castings will be finding much wider acceptance in the automotive industry, and both large and small operators are girding to get their share of this business. Briggs, for example, is planning to move a small foundry it now operates in its Conners road aircraft plant, originally designed to furnish kirksite die requirements, to its Mound road plant where facilities would be extended to include, aluminum, magnesium, brass and other metals, some possibly in production quantities for use in plumbing ware the company will manufacture.

Other operators are convinced there is a profitable future in jobbing a variety of aluminum and magnesium castings, and are making plans to open new enterprises. Detroit Suburban Foundry is operating a magnesium casting plant north of Pontiac on the road to Flint. Two ambitious youngsters have even opened a small aluminum foundry in a neighborhood garage, and ply their trade there three nights a week, while still working elsewhere during days. They figure their midget foundry at least may pay off in terms of the education and training it will provide its two owners.

OPA Honors Steel Advisory Group

Members of the Steel Castings Industry Advisory Committee to OPA were presented with certificates of meritorious service at a luncheon at the Edgewater Beach hotel, Chicago, Feb. 13, on the concluding day of a two-day conference with OPA executives. This was only the second instance in which an award for distinctive service has been given to an industry advisory group, the first being the one to the Scrap Industry Advisory Committee recently.

The presentation was made by Rae E. Walters, regional administrator, OPA, Chicago, on behalf of Chester Bowles, OPA administrator, Washington. The citation on the certificates read as follows:

"Since July 2, 1942 this committee by its sound advice and devotion to the welfare of the Nation, has helped the economy withstand the strains of global war and preserve its stability for future generations of Americans."

Advisory committee members present to receive the certificates were: C. L. Harrell, vice president, Sterling Steel Casting Co., East St. Louis, Ill., chairman of the committee; J. A. Sauer, president, Symington-Gould Corp., Rochester, N. Y., vice chairman; C. L. Snowdon Jr., vice president and secretary, Reliance Steel Casting Co., Pittsburgh, secretary-treasurer; George Alston, secretary-treasurer, General Steel Castings Corp., Eddystone, Pa.; N. K. Anderson, president, Alloy Steel & Metals Co., Los Angeles; E. E. Burk, assistant to works manager, Commercial Steel Castings Division, Otis Elevator Co., Buffalo; Herbert Farrell Jr., vice president, Farrell-Cheek Steel Co., Sandusky, O.; M. A. Fladoes, president, Sivyer Steel Casting Co., Milwaukee; T. H. Harvey, vice president, Ohio Steel Foundry Co., Lima, O.; A. J. McDonald, vice president, American Steel Foundries, Chicago; F. M. Robbins, president, Ross-Meehan Foundries Inc., Chattanooga, Tenn.; Thomas H. Shartle, president, Texas Electric Steel Casting Co. Inc., Houston, Tex.; and Clarence Tolan Jr., president, Dodge Steel Co., Philadelphia.

Not present but awarded certificates were two other committee members—C. W. Howat, district sales manager, Continental Foundry & Machine Co., Pittsburgh; and L. C. Wilson, general manager, Reading Steel Casting Division, American Chain & Cable Co. Inc., Reading, Pa.

Representatives of OPA attending the meeting and conferring with the advisory committee were: Weldon Welfling, chief of Castings Section, Iron and Steel Branch, OPA, Washington; Warren M. Huff, price executive, Iron and Steel Branch; Morris Hershson, chief counsel, Iron and Steel Branch; Charles Sweeney, chief, Accounting Section, Iron and Steel Branch; Frank Pisula, senior accountant, Iron and Steel Branch; Miss Eva Eisenberg, economic analyst, OPA, Washington; Lynn F. Jorgensen, chief, Iron and Steel Unit, OPA, Chicago; E. L. Jones, chief, Industrial Materials and Manufacturers Division, OPA, Chicago.

Lt. M. H. Blackshear, USN, liaison officer between Navy and OPA, Washington; and Major Lynn G. Wood, purchases division, headquarters, Army Service Forces, Washington, represented the armed forces at the conference.

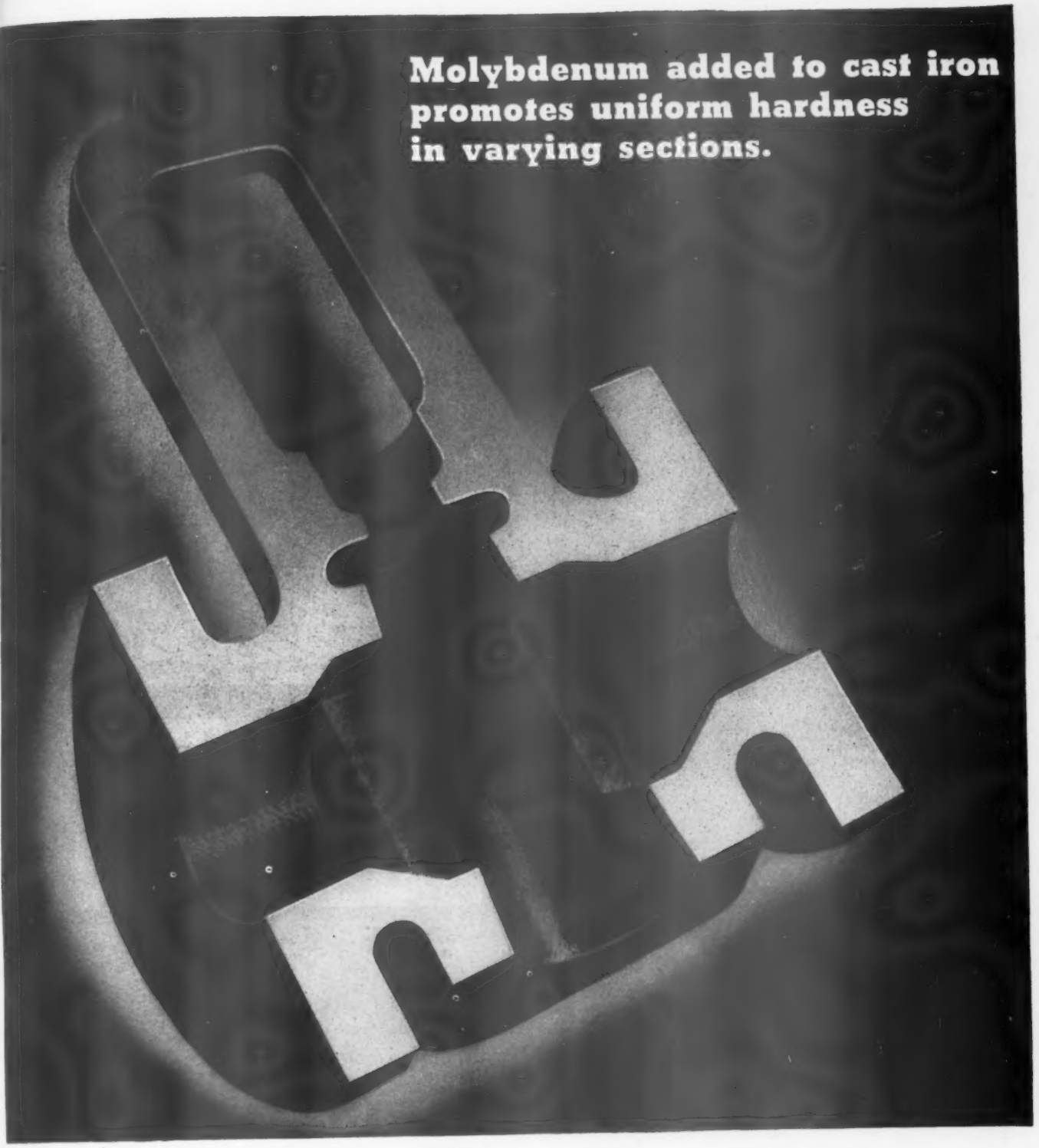
Among invited guests attending the luncheon were Oliver E. Mount, secretary-treasurer, American Steel Foundries, Chicago, formerly a member of the advisory committee and its original chairman; and D. D. Kennedy, formerly price executive, Iron and Steel Branch, OPA, Washington, and now assistant general manager, Farrell-Cheek Steel Co., Sandusky, O. Both had contributed prominently in the organization and early activities of the committee.

Conduct Courses in Foundry Practice

Philadelphia and Western New York Chapters of the A.F.A. are co-operating in the holding of foundry practice courses under the sponsorship of the Engineering, Science and Management War Training Program of United States Government. These courses are open to men in the foundry industry who wish to broaden their knowledge of foundry practice, and are tuition free.

The Philadelphia course, lasting 12 weeks, started Feb. 7 and is held each Wednesday at 7:15 p.m. in the Engineering building, University of Pennsylvania, 33rd and Locust streets, Philadelphia.

Two courses are being given at Buffalo. One, conducted by James L. Yates, Worthington Pump & Machinery Corp., Buffalo, in modern foundry practice, began Jan. 29, and continues on Mondays at 7:15 p.m. A course in ferrous foundry metallurgy, given by Henry C. Winte, also of Worthington Pump & Machinery Corp., Buffalo, began Jan. 30 and continues on Tuesdays at 7:15 p.m. Both are 16-week courses and are being given at Crosby Hall, University of Buffalo, 3435 North Main street, Buffalo.



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Crown Hill Seacoal vents rapidly due to its high volatile content which ensures quick ignition and a long flame. To vent the mold quickly is the primary function of a seacoal —that's why we selected the high volatile, quick-flash coal from which Crown Hill Seacoal is made.

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WISCONSIN

Holds Eighth Annual Foundry Conference

By EDWIN BREMER and WILLIAM G. GUDE
The Foundry
ALFRED W. GREGG
Whiting Corp., Harvey, Ill.
BRADLEY H. BOOTH
Carpenter Bros. Inc., Milwaukee

KEEN interest of foundrymen in the Milwaukee area in exploring every avenue which might result in increasing their production of castings for the war effort was exemplified by the record-breaking attendances at the various sessions of the eighth annual foundry conference sponsored by the Wisconsin Chapter, A.F.A., and the College of Engineering, University of Wisconsin, at Hotel Schroeder, Milwaukee, Feb. 8-9. Total registration was approximately 600, the largest so far recorded.

The opening session Thursday morning was addressed by Dean F. Ellis Johnson, College of Engineering, University of Wisconsin, who welcomed those attending, and discussed the furthering of technological advances in the foundry industry.

Prof. Don Lescohier, University of Wisconsin, spoke on the subject "Current Wage Problems" at the Thursday luncheon at which Harry E. Ladwig, Allis-Chalmers Mfg. Co. and president, Wisconsin Chapter, presided. Professor Lescohier traced the parallel rise in wages and in worker productivity over a long period of years, and pointed out that maintenance in the postwar period of current high wartime wages or of further increases over present levels is dependent on the future trend in output per worker. Emphasizing the dependency of wages upon volume of production, he called attention to the potential danger to our industrial system of that brand of thinking which calls for hours and wages out of proportion to the unit cost of work performed.

Dr. Ralph L. Lee, General Motors Corp., Detroit, was the principal speaker at the Friday luncheon, with R. C. Woodward, Bucyrus-Erie Co., Milwaukee, presiding. Dr. Lee's topic was "Humanics in the Foundry," and he stated that in general we have been so concerned with group relationships that we have overlooked the fact that no two people are alike. Since groups are composed of individuals possessing different characteristics, the proper approach is to make man-to-man contact. Individuals cannot be changed easily as they are proud of the fact that they differ from some one else. However, by getting closer to the individual, a better understanding will be had on both sides.

Annual banquet of the conference was held Thursday night, with over 700 in attendance. Harry E. Ladwig, chairman, introduced Jack H. Lieb, news reel cameraman, who presented some intensely interesting colored motion pictures entitled "From D-day to Germany" and described his personal experiences in making the pictures.

The first session Thursday morning, held under the direction of C. W. Morisette, Milwaukee Vocational School, was devoted to a discussion of responsibility in apprenticeship by Dr. William F. Rasche, Milwaukee Vocational School; William F. Patterson, War Manpower Commission, Washington, and C. W. Wade, Caterpillar Tractor Co., Peoria, Ill. Dr. Rasche stated that the shortage of all-around skilled men has led to breaking down operations into component small parts which are performed by workers trained in just those. However, a good vocational system can remedy the lack of skilled men with close co-operation of industry, and the closer co-operation, the greater the benefit to both. He pointed out that the vocational school can be of material assistance to industry in selecting suitable boys for apprentice training if permitted to study their aptitudes during a probationary period.

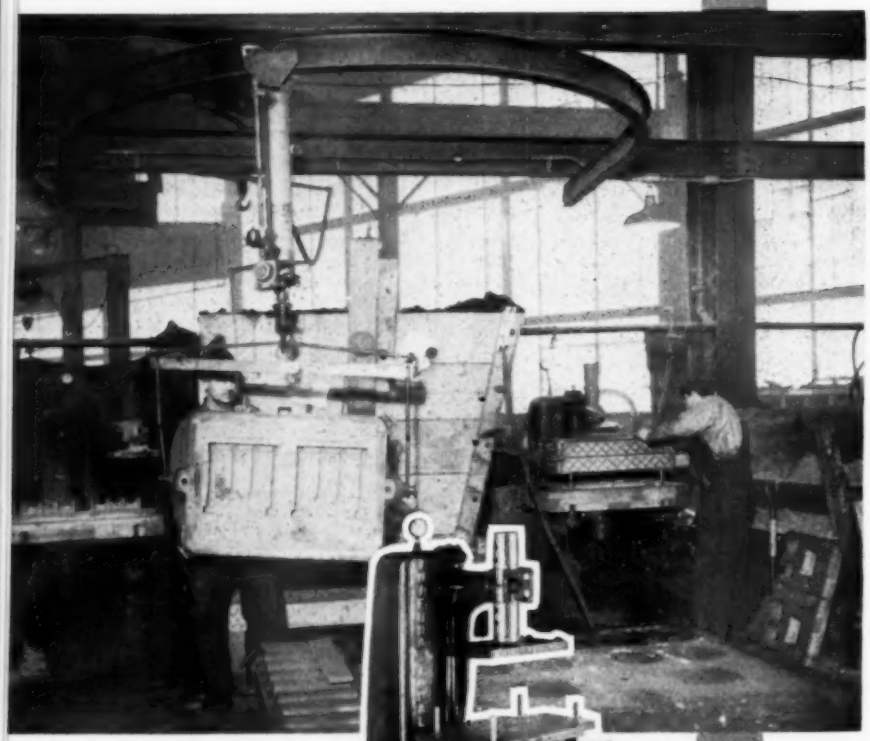
Mr. Patterson complimented foundrymen on the miraculous job they have done in the war effort. However, he said that production must be further increased, and that just now the time element is particularly important. He pointed out that the foundry industry has the responsibility to carry on the apprenticeship program in the best possible way to provide a well-rounded education. Best results can be secured by co-operation of industry with municipal, state and federal agencies. Need for more apprentices is indicated, he said,

(*Continued on page* 128)

Banquet scene at foundry conference of Wisconsin Chapter of A.F.A. and University of Wisconsin

Type LP

All Foundry Views courtesy



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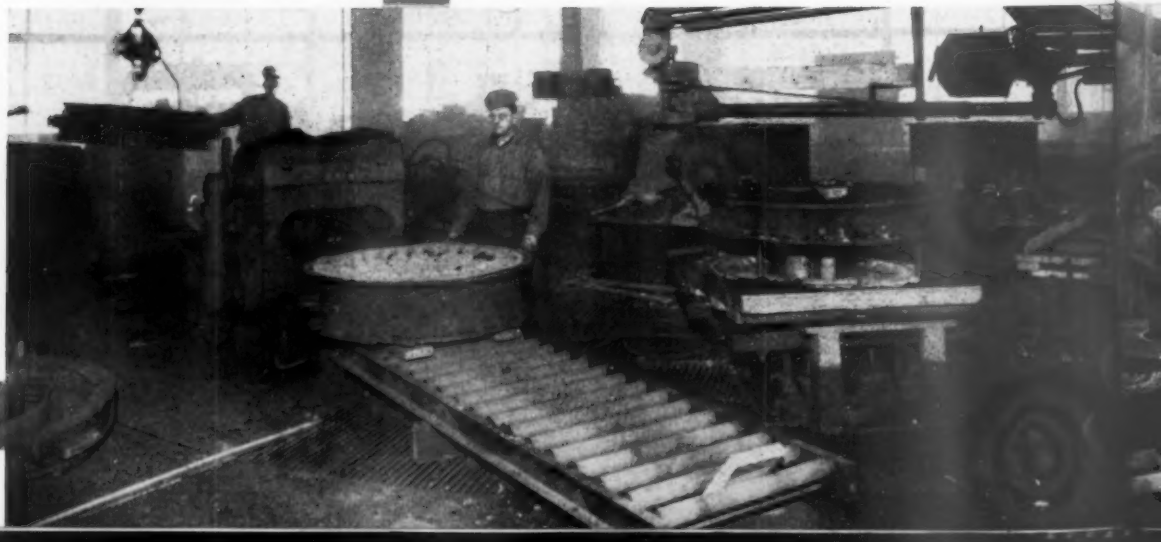

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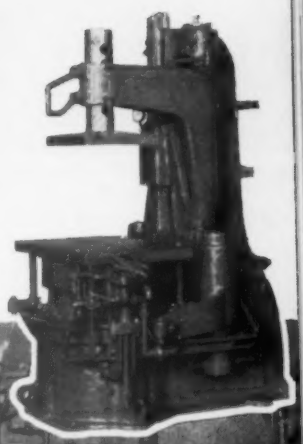

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INTERNATIONAL MOLDING MACHINES

Type LP Power Pin Lift Machine

Type PK Jolt, Squeeze, Power Pin Lift Machine
Heavy Duty Design

Type PKL Jolt, Squeeze, Power Pin Lift Machine

Type A Power Turnover, Power Draw Machine

INTERNATIONAL MOLDING MACHINE CO.

2608 – 2624 West Sixteenth Street
CHICAGO, ILLINOIS

Type A

(*Continued from page* 125)

by the fact that in 1910 the average age of molders was 35 years, but by 1940 it had increased to 42½ years. Also, that in 1910 apprentices constituted 6 per cent of those in molding while in 1940 they had dropped to 1.8 per cent. Mr. Patterson made an urgent plea to all foundries large and small to consider establishment of apprenticeship programs to produce the future skilled foundrymen.

Concluding speaker at the session was C. W. Wade who pointed out that a good, thorough apprenticeship program was of inestimable value to the individual firm. Students become familiar with the firm's policies and practices, and gain an excellent understanding of its problems; consequently, the graduates become intensely loyal. He said that any firm, no matter how small, cannot afford not to have some type of training program. Numerous agencies have services available to aid in establishing and carrying out such a program. Mr. Wade mentioned that his own firm has for a number of years carried on eight major training programs. Three of them are 4-year courses in machine shop, foundry and patternmaking which are designed to produce men to fill key positions. The remaining five vary from 12 to 16 months and are for men who wish to broaden their skills. In addition, the firm has numerous shorter, specialized courses.

Discuss Gray Iron

Sectional meetings of the various branches of the industry began Thursday afternoon and continued through Friday. First session on gray cast iron related to metallurgy for practical foundrymen, with Dan Krause, Battelle Memorial Institute, Columbus, O., the speaker. He said that the metallurgy of gray iron was the most complicated of all alloys, and yet it is produced in a greater tonnage than any other cast metal. Important properties are tensile strength in which it can be developed to give a high value, but usually with low ductility, brinell hardness can be made to vary over a wide range through choice of composition and molding procedure. A rule of thumb method in which the value of the tensile strength divided by the brinell hardness is over 200 usually indicates a good quality iron. Other properties of importance include machinability, damping capacity, impact strength, transverse strength and microstructure.

Important features in producing good gray iron are composition, melting practice and metal handling. Elements found in gray iron in the order of importance are carbon, silicon, manganese, sulphur, phosphorus and special alloys. In melting practice the important factors are materials used in the metal charge, coke, and blast. In metal handling the important phases are temperature, handling equipment, and foundry layout. Carbon equivalent is useful in producing the correct type of metal for a particular section size. That value is determined by adding one-third the silicon content to the total carbon content. In general the following relationship has been found to exist between carbon equivalent and tensile strength:

C.E.	Tens. Str., p. s. i.
3.8	43,000
4.0	39,000
4.2	34,000
4.4	28,000

Hot iron has good metallurgical properties that cannot be attained with cold iron. The chill test bar is a good indication of the quality of gray iron provided composition and melting practice are kept uniform. Controlling section size is one of the most important factors to be considered when making a casting to specifications. In general test bars do not receive proper attention in the foundry, and many times are made with a rough surface

with flaws, or poured with cold iron. Their production should be given as much attention as the most particular casting.

Second session on gray iron was on the subject of shrinks and blows, with William A. Hambley, Ailis-Chalmers Mfg. Co., Milwaukee, as the speaker. He stated that blowholes are cavities caused by bubbles of gas trapped in or by the metal. They are usually found in the cope although they may appear anywhere in or on the casting. Gas follows the line of least resistance. Several sources of gas in the metal include moisture which, in addition to being the most important variable in the foundry, is the most difficult to control. When water changes to steam at 212 degrees Fahr., it increases in volume 1600 times. Moisture can be derived from core sand, molding sand, binders, core paste, cupola bottom, green ladles, and damp and rusty chaplets.

Contaminated metal is another source, and includes rusty scrap as well as extraneous alloys such as antimony, aluminum, tin and zinc. Seacoal, core binders and inocculants as well as the blast may be sources of gas. Gas may be formed in the metal during solidification or may already be present in the cold metal and unable to escape, because of improper venting, hard ramming and clay balls. Shrinkage is a defect which shows up as a cavity or depression and is caused by varying rates of contraction as the metal changes from a liquid to a solid. Generally it appears as a jagged hole or spongy area, and usually is lined with dendrites. True liquid shrinkage is a settling of the metal due to gravity which, if properly fed, would not develop. Three kinds of shrinkage are volume shrinkage in the liquid state, that due to volume changes during solidification, and linear shrinkage after the metal is set. Molten metal in the casting is drawn from one part to another, but never uphill. True liquid shrinkage is always downward. In the majority of cases blowholes can be traced to poor foundry practice, while shrinkage usually is the fault of poor design.

Third session on gray iron had Frederick G. Sefing, International Nickel Co., New York, discussing molding methods for sound castings. Clean metal poured into the mold cavity is of first importance, and to that end, use of skim gates, slag traps or swirl gates is effective. Gates should be rectangular in cross section where they are attached to the casting except when they are part of the feeding system. Total area of the gates should be sufficient to provide maximum pouring speed without washing the sand. Gating and risering should be based on principles of directional solidification which simply means that the coldest metal and thinnest sections freeze first, and the direction of freezing shall move toward the heaviest sections and the hottest metal.

Proper Venting Is Necessary

Riser connections to the casting should have a reduced cross section and be as short as possible at that point. Chills and denseners are used where risers cannot be placed conveniently. These must be clean to prevent blows, and large enough to perform the function they are designed for. Adequate venting of the mold is essential so that any gases generated can escape.

First nonferrous session consisted of a scrap clinic, with William Romanoff, H. Kramer & Co., Chicago, as discussion leader. As a preliminary to the actual examination of various defective castings submitted for study Mr. Romanoff stated that burnt metal never is found in the nonferrous foundry as it is in the iron and steel foundry, so it is not the cause of defects. Pouring temperature may result in trouble, and since many factors enter in the determination of the proper point, it should be found by actual experiment. Solid castings can be produced only when directional solidification is followed. Hence, gating must be arranged so that hot metal is in the riser, the last place to freeze.

Mr. Romanoff said that one of the simplest methods of determining whether a casting will meet requirements is to fracture it in various areas. If any faults are found, gating and risering can be changed or chills applied to correct the trouble.

(*Continued on page* 164)

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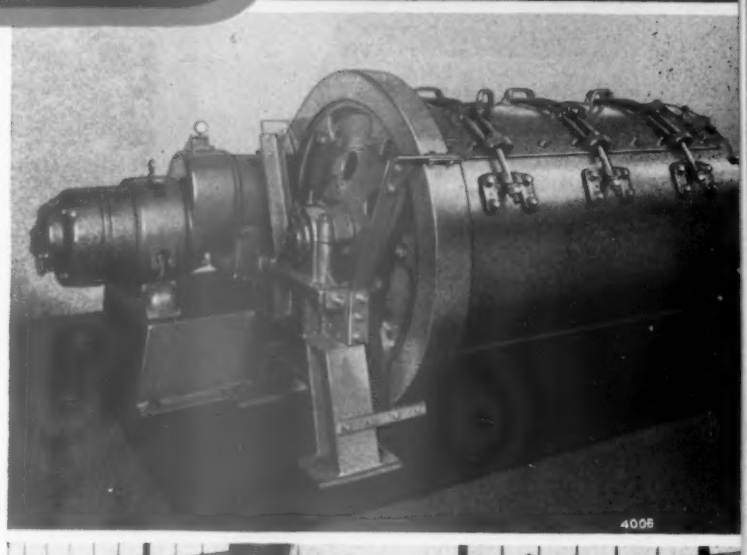

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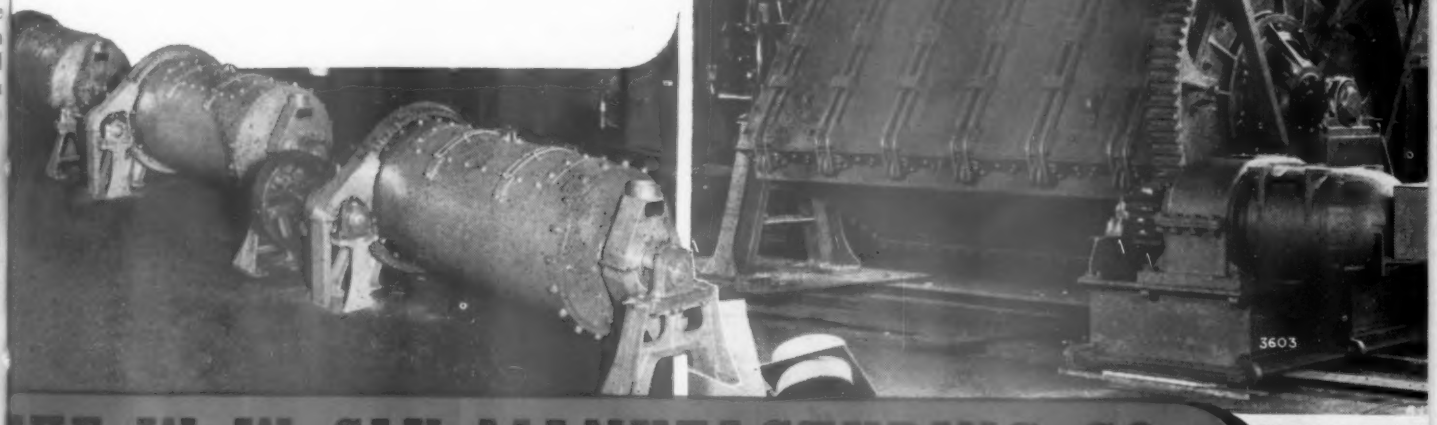

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FRED J. WALLS

OFFICERS and DIRECTORS Nominated by A.F.A.

SHELDON V. WOOD

NOMINEES for officers and directors of the American Foundrymen's Association were named by the 1945 Nominating Committee at a meeting in Chicago, Jan. 15, as follows:

For president, Fred J. Walls, International Nickel Co. Inc., Detroit. For vice president, Sheldon V. Wood, president and general manager, Minneapolis Electric Steel Castings Co., Minneapolis.

For director (one year): Retiring President Ralph J. Teetor, president, Cadillac Malleable Iron Co., Cadillac, Mich.

For director (three years): George K. Dreher, vice president, Ampco Metal Inc., Milwaukee; Edwin W. Horlebein, president and general manager, Gibson & Kirk Co., Baltimore; Harold H. Judson, foundry superintendent, Goulds Pumps Inc., Seneca Falls, N. Y.; James H. Smith, general manager, Saginaw Malleable Iron Division, General Motors Corp., Saginaw, Mich., and F. M. Wittlinger, secretary and general manager, Texas Electric Steel Casting Co., Houston, Tex.

Election of officers and new directors will take place at the association's business meeting, to be held in July, inasmuch as the annual spring convention for this year has been cancelled.

The following comprise the 1945 Nominating Committee: Chairman, D. P. Forbes, Gunite Foundries Inc., Rockford, Ill.; L. C. Wilson, Reading Steel Castings Division, American Chain & Cable Co., Reading, Pa.; W. E. Mahin, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.; Charles Morrison, Saginaw Malleable Iron Division, General Motors Corp., Saginaw, Mich; Martin J. Lefler, Strom Brass Foundry, Elkhart, Ind.; R. K. Glass, Republic Steel Corp., Buffalo; E. P. Trout, Lufkin Foundry & Machine Co.,, Lufkin, Tex.; Henry McFarlin, the Lunkenheimer Co., Cincinnati, and John W. Porter, American Steel Foundries, East Chicago, Ind.

Fred J. Walls

FRED J. WALLS, currently vice president of the association, is manager of the Detroit office, Development and Research Division, International Nickel Co. Inc., New York. He was born in Oakland county, Michigan, and received his technical education at the University of Michigan, specializing in metallurgy. He was employed by the Packard Motor Car Co., Detroit, and later by the Wilson Foundry & Machine Co., Pontiac, Mich., where he rose to the position of chief metallurgist in 1923. In 1932 he was consultant to the Eaton-Erb Foundry Co., Vassar, Mich., now the Foundry Division, Eaton Mfg. Co., and acted as manager prior to going with International Nickel Co. in 1934 in his present capacity. Mr. Walls is a past president of the Detroit Foundrymen's Association. He first served on the board of directors of the A. F. A. for 3 years starting in 1939, and has been active as a member of the Gray Iron Division as well as on committees of other technical societies.

Sheldon V. Wood

SHELDON V. WOOD, a director of A. F. A. since 1942 and a member of the executive committee, has been prominent in work of the association's Steel Division and of his local Twin City chapter. He had an active part in formation of the Twin City Chapter, successor to the Twin City Foundrymen's Association. Mr. Wood was born in Jefferson, Iowa, and was graduated from the University of Minnesota in 1904 as an engineer of mines. He started his business career as mining engineer with Butler Bros., Hibbing, Minn. From 1905 to 1907 he engaged in engineering work with the Great Northern Railway, St. Paul, and then was a sales engineer with Olds Gas Engine Co., Lansing, Mich., from 1907 to 1912. In 1913 Mr. Wood joined the Minneapolis Electric Steel Castings Co. as manager, subsequently becoming president, his present position.

Ralph J. Teetor

RALPH J. TEETOR, president, Cadillac Malleable Iron Co., Cadillac, Mich., was graduated from Purdue University in 1905 with a degree in mechanical engineering. He became associated with Link-Belt Co., Indianapolis, where he rose to the position of chief engineer, and in 1915 he was elected secretary of the Standard Malleable Iron Co., Muskegon, Mich. After World War I, in which he served as major of infantry and as division inspector, Mr. Teetor became vice president and general manager, Howe Chain Co., Muskegon, Mich. In

(*Continued on page* 172)

R. J. TEETOR

J. H. SMITH

G. K. DREHER

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F. M. WITTLINGER

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Foundry Statistics

Malleable Iron Castings

	Production (Tons)			New Net Orders (Tons)		
	1944	1943	1942	1944	1943	1942
Jan.	75 594	63.572	69,203	93.855	73,524	106.045
Feb.	74 812	66,401	65.140	79.352	87,728	66,292
Mar.	81.480	78.143	69.737	90.038	85.744	62.979
Apr.	69.820	72.539	71,256	88.169	74.241	60.398
May	70.553	69.959	60.696	92.285	77.768	54.219
June	70 993	69.111	59.990	103.692	78.289	55.032
July	61.320	66.011	61.434	106.626	91.653	63,651
Aug.	74.297	67.615	56.304	77.908	108.505	63.978
Sept.	74.628	74.874	61.021	49 502	99 911	87 697
Oct.	80,505	74,254	68,251	76,536	101,510	70,907
Nov.	79,579	72,077	59,287	47,824	93,370	74,080
Dec.		75,188	66,177	.	81,978	93,824
Total	. .	849,764	768,496	. . . .	1,064,224	859,102

Steel Castings

	Shipments (Tons)		Production (Tons)		New Net Orders (Tons)	
	1944	1943	1944	1943	1944	1943
Jan.	237,570	.....	159,795	154,736	167,739	213,130
Feb.	211,958	.....	161,359	151,530	173,592	191,217
Mar.	224,913	.....	174,626	176,470	162,575	202,731
Apr.	204,279	.....	155,778	161,403	175,053	165,792
May	210,360	.....	161,783	163,812	176,993	192,531
June	200,237	.....	157,444	163,934	181,816	171,774
July	176,785	197,592	131,940	158,783	169,921	187,281
Aug.	204,833	183,842	154,911	158 832	171,309	200,634
Sept.	189,443	202,049	144,458	157,818	129,847	214,086
Oct.	197,772	198 753	150,719	163 888	146,116	211 341
Nov.	.....	202,490	.....	158,813	.....	209,276
Dec.	.....	213,602	.....	158,626	.....	173,627
Total	.....	.....	.....	1,928,645	.....	2,333,420

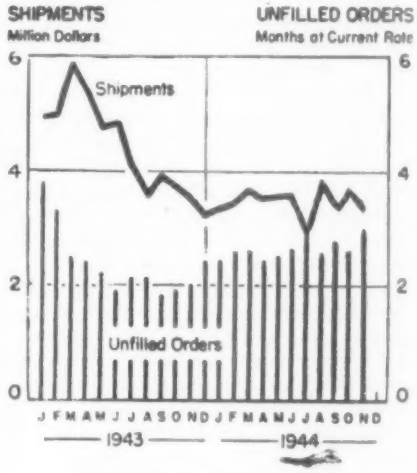
Note: Shipments for sale and own use; production and orders for sale only.

Aluminum Casting Shipments

(In millions of pounds)

	Total	Sand	Perm. Mold	Die
1942	324.0	207.5	60.6	55.9
1943	459.5	304.2	89.6	65.7
Jan.	33.1	21.9	6.4	4.8
Feb.	33.8	22.0	6.5	4.8
Mar.	38.7	25.8	7.9	5.5
Apr.	37.1	24.3	7.6	5.2
May	37.7	25.0	7.7	5.0
June	36.3	24.1	6.9	5.3
July	37.2	24.7	7.1	5.4
Aug.	38.2	25.4	7.2	5.6
Sept.	40.8	27.2	7.9	5.7
Oct.	42.7	28.5	8.0	6.2
Nov.	43.0	28.5	8.3	6.2
Dec.	41.4	27.3	8.1	6.0
1944				
Jan.	44.1	29.4	8.3	6.4
Feb.	43.9	30.2	8.0	7.5
Mar.	49.5	31.4	9.6	8.1
Apr.	42 9	27.0	8.3	7.3
May	44.7	27.9	8.9	7.5
June	42.4	25.9	8.8	7.4
July	38.7	24.5	7.7	6.2
Aug.	43.2	26.9	9.2	6.9
Sept.	41 5	25.5	8.9	6.9
Oct.	42.1	25.1	9.8	7.0
Nov.	40.5	24.3	9.6	6.4

Foundry Equipment, Supplies



Magnesium Casting Shipments

(In thousands of pounds)

	Total	Sand	Perm. Mold	Die
1942	34,960	32,292	1,364	1,304
1943	65 987	59 123	3,978	2,866
Jan.	4,376	3,934	253	189
Feb.	4,445	3,931	299	215
Mar.	5,384	4,862	300	262
Apr.	5,237	4,694	284	259
May	5,263	4,652	343	268
June	4,690	4,159	296	235
July	4,940	4,406	290	244
Aug.	5,238	4,770	257	211
Sept.	6,008	5,391	390	227
Oct.	6,774	6,096	431	247
Nov.	6,792	6,068	452	272
Dec.	6,840	6,220	382	238
1944				
Jan.	6,984	6,210	536	238
Feb.	7,293	6,603	469	221
Mar.	8,242	7,574	496	172
Apr.	7,516	6,918	413	185
May	7,357	6,664	514	179
June	6,535	5,729	598	208
July	6,481	5,653	656	172
Aug.	6,934	6,143	563	228
Sept.	6,945	6,147	606	192
Oct.	6,738	6,062	515	161
Nov.	6,639	5,919	521	199

GRAY IRON CASTINGS—Production, Shipments, New Orders, Unfilled Orders

MONTHLY TOTALS (tons)—1944

	Production	Shipments	New Orders	Unfilled Orders
Jan., 1944	793 884	765.423	517.466	2.259.158
Feb.	772 764	764.369	650.238	2.115 027
March	840.890	828.648	867 889	2.184 268
April	765.784	757.880	732 892	2.159.280
May	789 007	790.674	835 966	2 204.572
June	765.581	763.459	772 070	2.213.183
July	698.418	689 744	700 206	2 313 645
Aug.	778,388	778 205	799.754	2 335.194
Sept.	768,661	744,954	714,083	2,304,323
Oct.	788,196	780,453	739,234	2,296,690

CAST IRON SOIL PIPE—1944

	Production	Shipments	New Orders	Unfilled Orders
Jan.	11.322	11.369	10.235	12.344
Feb.	12.801	13.329	19 031	18.046
March	14 585	14.224	19.349	23,171
April	13 351	13.923	20.676	29.924
May	13.653	16.519	21.832	35.237
June	13.969	16.204	29.369	48.402
July	12 523	14 885	23.480	56.997
Aug.	15,103	15.945	19.355	60,407
Sept.	13,730	15,200	21,796	67,003
Oct.	14,558	15,417	23,733	75,319

CAST IRON PRESSURE PIPE—1944

	Production	Shipments	New Orders	Unfilled Orders
Jan.	36.146	32.080	32.010	73.824
Feb.	32.004	31.303	32.155	74,676
March	34.570	36.022	47.964	86.618
April	32.807	32.808	34.650	88,460
May	38.247	41.085	43.793	91.168
June	36,167	40.400	39.737	90.505
July	39.314	40.821	64.901	114.585
Aug.	44.009	46 031	45,523	114,077
Sept.	45,645	44,761	61,797	131,113
Oct.	46,123	51,603	45,659	125,169

BY TYPE—LATEST MONTH REPORTED

Type of Casting	Production	Shipments	New Orders	Unfilled Orders
Cast iron pressure pipe	46,123	51,603	45,659	125,169
Cast iron soil pipe	14,558	15,417	23,733	75,319
Chilled car wheels	81,046	73,682	56,520	223,878
Ingot molds	175,938	172,164	155,558	290,633
All other gray iron	470,531	467,587	457,764	1,581,691
Total Oct. 1944	788,196	780,453	739,234	2,296,690

WPB figures reported by Bureau of the Census

The adventures of BILL

BY PAT DWYER
Drawings By RICHEY

SOME time ago—O well, if you insist, Sept. 29,—one of my old foundry friends, usually a quiet and well behaved lad, boiled over. He dipped his rusty—pardon me—trusty pen into his favorite bottle of green ink and vitriol, to direct my attention to an article by Louis Bromfield in the October issue of the *Reader's Digest*. The dates are correct. As with nearly all magazines, the *Digest* gets out here a week or more before publication date. The worthy brother was quite properly indignant over Mr. Bromfield's contemptuous reference to the metal in agricultural machinery. 'No good,' says he. 'Sometimes *MERE CAST IRON*.'

"How about you and Bill getting together on this thing," the comrade very kindly suggests. "Brew up a pot of good stinking and scalding hot, black and bitter medicine guaranteed to melt the congealed and ignorant packing out of this here now party of the second part. Show him that cast iron plays a prominent part in practically every activity of the human race from the cradle to the grave, and even before the one and after the other. Mere Cast Iron, Indeed!" I can imagine the noble snort with which the comrade concluded this sterling epistle.

When I laid the proposition before Bill recently, he agreed instantly that it indeed would be a privilege and a positive pleasure to light the torch, boil the pot or contribute in any other reasonable manner to the worthy cause. He said he had read the half-baked and indigestible essay and had been tempted at the time to lay a sharpened spear in rest to take a poke, or a tilt or whatever you call it, at the smug and complacent author.

"It just goes to show," he said, "that the old gazabo who coined the old reliable proverb about the advisability of the shoemaker sticking to his last had—as we uncouth foundrymen say among ourselves—quite a gob of stuff on the ball. With malice toward none and charity for all, we may admit that probably in the opinion of some people, the author of the article is considered a fairly competent journeyman fiction writer. However, fact and fiction are two different things. Knowledge of the technique of one does not necessarily confer ability to write of the other. Even in the foundry, as you probably have observed, this general observation holds true. A molder accustomed solely to the production of stoveplate or other light gray iron castings would cut a sorry figure if faced with the problem of constructing a loam or dry sand mold for a large, heavy casting. Conversely, a man thoroughly familiar with the production of large castings would not earn enough on a snap flask bench to buy his usual daily quota of chewing tobacco.

"In the present instance the author of the article presents what he probably considers a complete coverage of a new type agricultural tractor developed in Ireland by a man named Ferguson, and now manufactured in a section of the Ford plant in River Rouge, Mich. Part of the material bears a strong resemblance to the type of literature—save the mark—issued by a publicity agent. This writing-made-easy technique, either lifting the stuff bodily or changing a word here and there, is practiced quite extensively in recent years by skimmers who know no more of what it is about than my dear old grandmother knows about shooting snipes with a bow and arrow."

"Reminds me," I said, "of one of the fugitive items that meets the eye now and again and then disappears from memory. Recollection of the item remains, but nothing of any surrounding features, where, when, what, why or how. For your benefit my lad, I am thinking of a short paragraph touching on this writing-made-easy technique. I think the writer hit it off rather neatly: 'When a writer steals from one author,' he says, 'it is known as plagiarism and is considered very low down stuff, decidedly not cricket. When he pinches, grabs, roots, lifts or otherwise annexes stuff from several authors, it is known as research and is regarded with admiration by one and all with the possible exception of the various authors left gasping and holding the bag."

"Purry good," Bill admitted. "Purry good. I must try to remember that little bon mot. If this *Digest* writer had confined himself strictly to either plagiarism or to research, we ordinary run-of-mine readers could take it or leave it alone, even though as in this case, it is nothing but a thinly disguised boost for the new tractor. Unfortunately, the peculiar bland, self-satisfied and know-it-all complex which seems to afflict every author after he has had a book published, leads our present author to insert opinions of his own here and there in the text. For example:

Medicine men brew some strong stuff

"'After the war,' he solemnly assures us with all the dignity and finality of at least an archbishop manipulating the bell, book and candle, 'when materials of all sorts become available in unlimited quantities, Ferguson hopes to reduce the price through mass production by perhaps as much as a third, and by building the tractor of abundant aluminum, to reduce the total weight by some 500 pounds.'

"Why not magnesium or plastics or beaver board, if weight is such an important factor? Carried to a logical conclusion, the tractor of the future may be built of spider webs or tissue paper, and so light it will have to be equipped with ballast tanks or carry a few hunks of pig iron to hold it on the ground where the going is rough. An all-aluminum tractor would be a handsome object after dragging a heavy plow or other piece of agricultural equipment all day through a field heavily impregnated with—let us say conservatively—722 lightly concealed roots, rocks and stumps per acre. Metallurgists, foundrymen and the lad in the front office who pores over cost figures, probably will pay their first visit to an oculist after they see an aluminum cylinder block on a tractor."

"I suppose," I said, "your diligent eye caught the gleam of another gem in the collection: 'In his plan to outdo the horse, Ferguson has developed machinery which can cultivate a small garden plot, or even go inside a commercial vegetable or flower hot house.'"

"That," said Bill, "is something I shall have to see. Seems to me a man with a small garden plot will have a man's size job on his hands, not in maneuvering a tractor in a space which probably could be dug up with a spade in the hands of a fair lump of a boy in an hour or two. Not at all, but in trying to convince the little woman, the best pal and severest critic and the invisible power behind the throne, trying to convince her that a raid on the joint account for $1000 to buy a tractor, is justified from any possible or impossible standpoint. Especially, and she certainly

(*Concluded on page* 136)

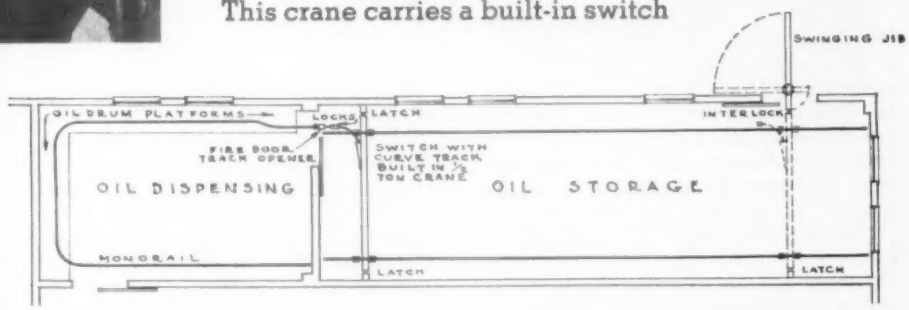
$1140.

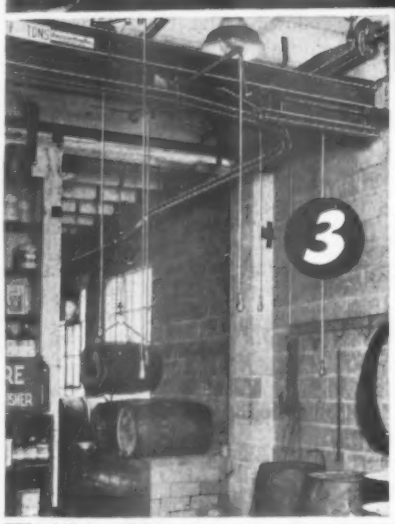
AMERICAN MONORAIL SYSTEM INSURES

FIRE PROTECTION • LOW COST HANDLING • ORDERLY STORAGE

All handling of oil drums through storage and dispensing is done systematically at greatly reduced cost.

This installation represents only a small investment. At a cost of only $1140 the system includes a standard jib crane which interlocks with a special bridge crane inside the oil house. This crane carries a built-in switch





1. Special crane carries drums across switch to track in dispensing room.
2. Loop of track connects through fire door for hoist service over dispensing shelves.
3. Storage crane with built-in switch allows passage of drums through fire door.
4. Swinging jib removed drums from trucks allowing passage to crane in oil house.

permitting passage of hoist to a curve connecting through the fire door to the single track loop of MonoRail around the dispensing room.

Here is another example of a low price system furnishing low cost operation of American MonoRail equipment. Let an American MonoRail engineer show you the answer to your troublesome handling problems at no cost to you.

THE AMERICAN MONORAIL CO.

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(*Concluded from page* 134)

can go to town harping on this item, especially since the machine will find employment only for a week or two each year. The remainder of the time it will be bogged down back of the barn with rust and general obsolescence eating it away at the rate of 25 to 50 per cent per year.'

"Well, of course," I admitted, "that is a debatable point, depending to some extent on whether the jolly farmer in the dell is pulling in single or double harness, and depending even to a greater extent on whether the joint account would stand a raid of $1000. It might be a good plan to refer that item back to the committee on Where Do We Go From Here?"

"That is one solution," Bill said. "When the committee has finished a reasonable bit of research and hired an expert or two to look into the subject, they will submit the usual report that the project has to be abandoned for lack of funds. The joint account has been exhausted, and therefore the problem on which they toiled so diligently no longer exists. All of which —with tongue in cheek—is respectfully submitted. Personally, I think a more sensible attitude is to ignore the point altogether and take up the next item.

"This item seems to indicate more than a passing familiarity with the Sage of Dearborn. 'In 1938 Ferguson came over again and gave a demonstration of the system for Ford at Dearborn. Ford did not wait until the demonstration was finished. 'I understand it,' he said. 'I'm with you as far as you want to go.'

"No person," Bill continued, "doubts Mr. Ford's ability to distinguish between a hawk and a hand saw. However, at a pinch I could present at least 47 reasons for doubting that the author was present and formed part of a trio at this important conference and demonstration. With the Baron of radio fame one may be tempted to ask 'Vos you dare Shaulie?'

"No particular importance attaches to the actual words spoken back in 1938. My objection is based on the positive manner of presentation. For all any person in this year 1945 knows to the contrary, Mr. Ford in 1938 might have said, 'Mighty fine contraption you have there Ferguson. Mighty fine. If you knock off this doodad, change this here hickey from the right to the left, set the dingus at a different angle, set the parleyvoo valve in the center instead of at the end, raise the exhaust and lower the intake, rig her up with a special chamber for extracting gas from old political speeches, I believe you have something! Glad to have met you Ferguson, old man. Come around and see me again some time.'

"Now I ask you, isn't that imaginary speech just as plausible as the other?"

"We are not here," I pointed out, "to make comparisons between literary styles including manner of setting down imaginary conversation. We're here because—"

"O, sure. We're here because we're here. We're here because, like old raggedy Don Quixit you felt like taking a run against a windmill. Me? I just came along for the ride like the Don's first helper Sanko Pansy or Hanky Panky or whatever was the guy's name.

"Having disposed of what you might call the minor items of irritation, we now come to the $64 statement, the prize gem in the entire collection. This statement seems to indicate that the inspired and reckless author did a skimpy bit of researching in the works of other equally ill-equipped researchers who knew no more of the subject than he did, and that may be set down as approximately minus zero, or a large goose egg.

" 'Most farmers will agree,' says he, 'that the development of agricultural machinery has lagged. Machinery was often clumsy and made of cheap and low grade stuff—sometimes—MERE CAST IRON.' "

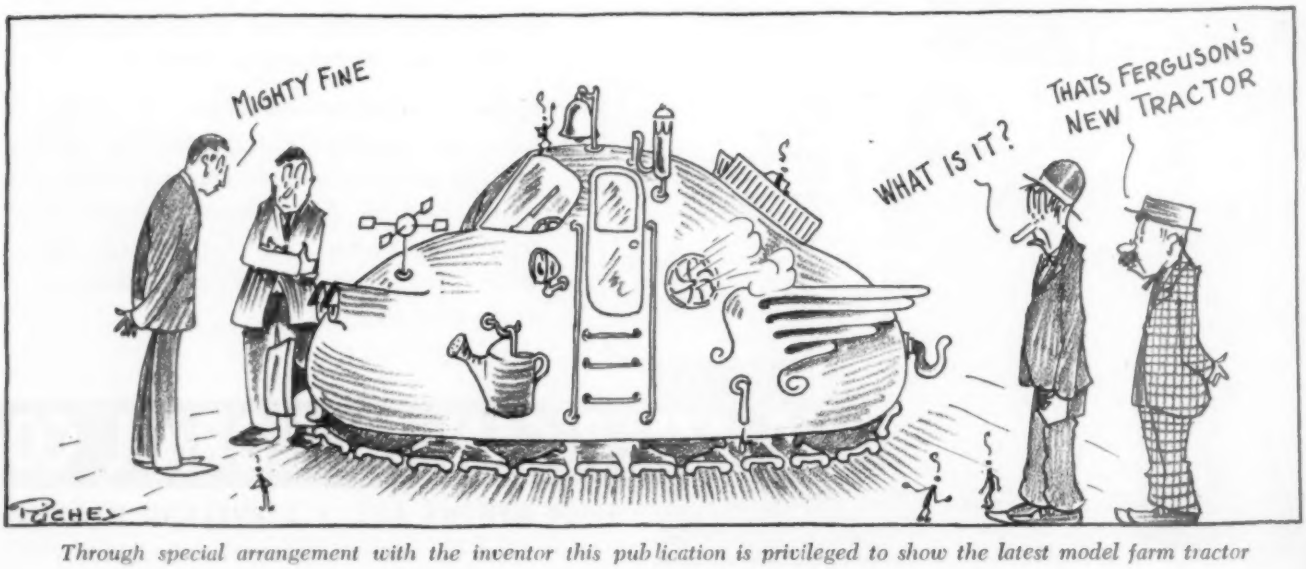
"That flippant, totally unjustified and contemptuous reference to the most widely used cast metal," I said, "is what ruffled the hackles on the neck of my correspondent and prompted him to write: 'The weak, brittle cast iron snake has been scotched so freely and completely in recent years, one would think rumors would have penetrated even the dense jungles of misinformation where fiction writers flourish and spawn. Is it possible that in the years our author spent abroad, he became tainted with the Bourbon family trademark: They never forget anything and they never learn anything.

" 'If it was not for the utter impossibility,' he says, 'of injecting information into a place where apparently desire for information does not exist, one might point out that approximately 3000 foundries in this country are engaged in the production of gray iron castings to the extent of 10,000,000 tons per year, castings that measure fully up to expectations in a highly satisfactory manner. Mere cast iron, indeed!' "

"Well," said Bill, "I'll tell you. If some of these self-appointed commentators came out of their twilight dens now and again, took a gander round through available sources of information and kept their eyes and ears open, they might be astonished to discover that the design, development and improvement of agricultural machinery has kept in step, and in many instances has led the procession in the great forward movement of civilization. Research laboratories are integral parts of all the great plants where agricultural implements are fabricated. Gray iron, with a tensile strength of 60,000 pounds per square inch, and other metal parts are as far ahead of the ancient parts as the great modern combine is ahead of the first modest little mowing machine constructed by Cyrus McCormick. A machine recognized as the most important factor in pushing the western frontier of the United States forward at the rate of 50 miles per year in the era of expansion following the Civil War. And first, last and all the time these machines have been assemblies largely of gray iron castings."

Appoints Canadian Representatives

Queen City Sand & Supply Co., Buffalo, has been appointed representative of the Cleveland Quarries Co., Cleveland, to handle the sale of refractories in the Province of Ontario, Canada, east of Brantford. National Foundry Sand Co., Detroit, will represent Cleveland Quarries in the district west of Brantford.



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CARBON has *low* heat transfer properties. Graphite has *high*. Paradoxically . . . because they are one and the same element! We manufacture both forms . . . as well as "Karbate" material which is either one made impervious to fluid seepage.

The paradox makes possible widely diversified uses of carbon and graphite. Built-up carbon furnace linings, for example, *insulate* outer furnace walls, while keeping their strength and shape at the highest temperatures encountered. In contrast, graphite chill molds for furnace "over-runs" *cool metals quickly* without cracking or sticking, and save shop time, materials and mess.

In "Karbate" heat exchangers, high heat transfer goes hand-in-hand with resistance to practically all corrosive chemicals . . . plus strength and dimensional stability.

These and many other chemical, metallurgical or textile industry applications of "National" carbon and graphite and "Karbate" specialty products depend on their sometimes paradoxical but always broad combination of useful properties. Inquiries are invited.

KEEP YOUR EYE ON THE INFANTRY . . . THE DOUGHBOY DOES IT!

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Carbon, Graphite, or "Karbate" materials, of course!

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Unit of Union Carbide and Carbon Corporation

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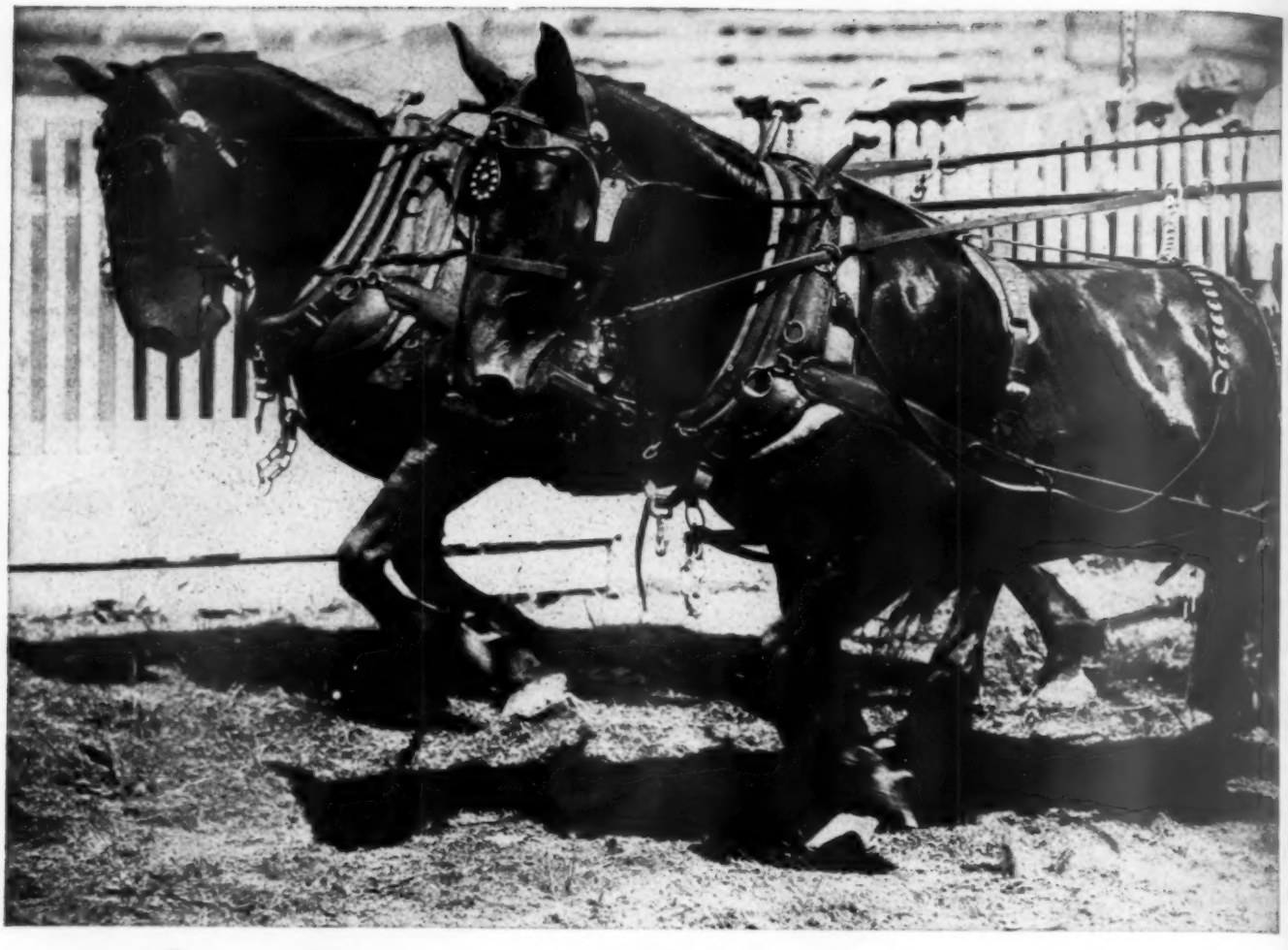

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FOR THE HARD PULL

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You can depend on them to save binder costs . . . reduce baking time and cleaning costs . . . increase oven capacity and core production.

MOGUL is a perfect Green Bond, which increases permeability in cores. Use MOGUL in cores for both green and dry strength.

MOGUL works with core oil; it decreases drying time and yields smooth cores. MOGUL works perfectly with pitch or resin, too, because cores can be handled while still warm. MOGUL is widely used with sharp sands.

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MOGUL *and* KORDEK
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KORDEK

KORDEK is a perfect DRY BOND which can be used in smaller quantities than most dry binders. KORDEK produces better castings with fewer discards.

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GROUPS

Metropolitan

GATING and risering came in for roundtable discussions at the meeting of the Metropolitan Chapter, A.F.A. at the Essex House, Newark, Feb. 5, with approximately 80 present. Kenneth De Long, International Nickel Co., New York, led the discussion on gray and malleable iron; William J. Phillips, manager of industrial sales, Symingtotn-Gould Corp., Rochester, N. Y., on steel; and Anthony Cristello, foundry manager, Eclipse-Pioneer Division Foundries, Bendix Aviation Corp., Teterboro, N. J., on nonferrous.

T. D. Parker, chairman of the Metropolitan Chapter, discussed the newly organized Technical Societies Council of New Jersey, which has been formed "for co-operative effort in increasing the services of the member societies to their members; to promote, co-ordinate and integrate inter-organization activities; to publish council periodicals, and to encourage participation in civic, state and national affairs." The council, it was pointed out, has no jurisdiction over the facilities, meetings or activities of any of its member organizations. A calendar of the meetings of the various technical organizations represented in the Council is now being issued monthly.

Mr. De Long, in substituting for Fred Sefing who at the last minute was unable to attend, quoted from a paper prepared by Mr. Sefing and also added various observations of his own in introducing the subject of gating and risering in the casting of gray and malleable iron.—*Ben K. Price.*

Canton

IN SPITE of inclement weather 56 members and guests attended the monthly meeting of the Canton District Chapter of the A.F.A., at the Elks' Club, on Jan. 11. Fred G. Sefing, International Nickel Co., New York, presented the subject, "A Study of Moulding Methods for Sound Castings," which was well illustrated by slides.

Mr. Sefing stated that important factors in the production of good castings include clean metal, type of gating, design, venting, and the use of chills, which when applied with regard for directional solidification, present the practical approach to improved castings. The speaker urged foundrymen to assume responsibility in bringing points of faulty design to the attention of engineers. He recommended that accurate records of production of good castings be kept so that the procedure may be more readily duplicated at a future time. A question and answer period was conducted during the talk.

Following Mr. Sefing's discussion, "Men of Fire," a sound film depicting the important position of the foundry in the nation's war production program, was shown.

Chairman Karl F. Schmidt announced with regret the resignation of vice chairman A. H. Lankford who is moving to Michigan. Mr. Lankford was actively interested in the organization of the Canton District Chapter a year ago.

Pictures of the chapter's fall picnic at the home of Otis Clay were shown, giving members who attended a chance to see themselves as others see them.—*Nils E. Moore, reporter.*

Texas

MEMBERS of the Texas Chapter of the A.F.A. who reside in Beaumont, Tex., were hosts at the January meeting. George E. Bryant, Oil City Brass Works Inc., and Hamp Mabry, Mabry Foundry & Machine Co., comprised the committee in charge of arrangements in Beaumont.

The golfing members had an opportunity to try the course at the country club, and an adding machine is said to have been needed to add the scores. Those desiring to visit foundries were taken on tours of any of the foundries in the city, upon request, and the trips proved mutually beneficial to members and to the local foundries. Dinner was served at Hotel Beaumont in the usual Texas manner.

Speaker of the evening was V. A. Crosby, Climax Molybdenum Co., Detroit, who gave a very informative talk on alloying iron. While the subject was of primary interest to gray iron men, the steel and nonferrous men were equally interested. Mr. Crosby was accompanied by E. R. Young of the Chicago office of Climax Molybdenum Co. Another guest was W. P. Wittke, Smith Oil & Refining Co., Rockford, Ill., who is a member of Northern Illinois Chapter.—*Leroy G. Stenzel, publicity chairman.*

Cincinnati

JOINT meeting of the Cincinnati Chapter of the A.F.A. and the Engineering Society of Cincinnati was held at the Engineers' Club, Jan. 8, with 150 in attendance. William Rengering, chapter chairman, presided.

Nathan Janco, owner of Centrifugal Casting Machine Co., Tulsa, Okla., gave a most interesting and educational talk on "Centrifugal Casting Methods," which he illustrated with slides showing various applications, both in ferrous and nonferrous work. Mr. Janco pointed out the advantages of centrifugal casting methods, types of castings to which the method can be applied, and types of molds used, both permanent and sand. He advised that in some cases, where percentage of casting yield is sufficiently high, installations of centrifugal methods are not warranted.

Active discussion followed the address. —*J. Schumacher, secretary.*

New England

FORTY-NINTH annual meeting of the New England Foundrymen's Association was held at the Hotel Gardner, Boston, Jan. 10. A special dinner was served, followed by election of officers for 1945.

New officers of the association include: President, M. A. Hosmer, Hunt-Spiller Mfg. Corp., South Boston, Mass.; vice president, B. W. Hagerman, Rice-Barton Corp., Worcester, Mass.; treasurer, Arthur

SAND COMMITTEE: *One of the most active committees of the Northern California Chapter, A.F.A., is its sand committee. Part of the group is shown at a meeting held at Phoenix Iron Works, Oakland, Calif. The picture was taken through courtesy of the Enterprise Engine & Foundry Co., San Francisco*

W. Gibby, East Boston, Mass.; secretary, Ernest F. Stockwell, Barbour-Stockwell Co., Cambridge, Mass.

Members of the executive committee are: B. W. Hagerman; D. L. Parker, General Electric Co., Lynn, Mass.; Arthur F. Dockry, H. & B. American Machine Co., Pawtucket, R. I.; Frederick M. Fitzgerald, Draper Corp., Hopedale, Mass.; Thomas I. Curtin, Jr., Waltham Foundry Co., Waltham, Mass.; and Charles A. Reed, Rogers-Brown-Lavino Co., Cambridge, Mass.—*Merton A. Hosmer, president.*

Saginaw Valley

TWO hundred members and guests of the Saginaw Valley Group, A.F.A., turned out for its Feb. 1 dinner meeting at the Fischer Hotel, Frankenmuth, Mich.

Seated with the Saginaw Valley Group officers were the speaker, A. L. Boegehold, General Motors research metallurgist; Fred Walls, national A.F.A. vice president; R. G. McElwee, chairman of the Detroit Chapter; and James H. Smith, general manager of Saginaw Malleable Iron, who is scheduled as the speaker for the May meeting.

Mr. Boegehold's topic was "Modern Cast Irons." Slides were used to illustrate the effect of such factors as chemical composition, temperature, section size, and

(*Continued on page* 142)

NEW ENGLAND ANNIVERSARY: *Large attendance marked the 49th annual meeting of the New England Foundrymen's Association at Boston, Jan. 10. Photos courtesy of C. A. Wyatt, Debevoise-Anderson Co., Boston*

GET ALL THE FACTS . . . AND YOU'LL CHOOSE PENOLYN CORE OIL!

If you have a problem—drop us a line. Our engineers are known throughout the industry for the right answers to tough problems.

1. **UNIFORMITY**—rigid laboratory control; no "settling out" in drums or storage tanks.

2. **CONCENTRATED FORM**—high sand to oil ratio; economical.

3. **NO OBNOXIOUS ODOR**—during mixing, baking or pouring.

4. **NO SEEPAGE**—will not settle or drain to the bottom of sand mix or green, unbaked cores; baked cores will not stick to plate.

5. **NO CRUSTING OF GREEN MIX**—air dries slowly; green mix can be stored as long as 24 hours and still be usable.

6. **CLEAN WORKING**—eliminates frequent cleaning of core boxes; sharp draws.

7. **WIDE TEMPERATURE BAKING RANGE**—small and large cores can be baked at the same time; no burnt cores.

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9. **MINIMUM GAS**—less venting; fewer blows; lower casting losses.

10. **AMPLE COLLAPSIBILITY**—no hardened lumps to dig out; disintegrates while allowing metal to solidify and cool; fewer cracked castings.

(*Continued from page* 140)

cooling rate in the mold upon the metal structure and upon physical properties.

The speaker discussed the beneficial effects of late additions of inoculating agents such as silicon, titanium, and various proprietary alloys sold for this purpose. Photomicrographs were used to illustrate the effects on form and distribution of the graphite flakes. Properties and structures imparted to cast iron by the alloying elements, such as chromium, nickel, molybdenum, and vanadium, were shown by charts and photographs.

After-dinner entertainment was furnished by Lorenzo Sturkey, of Midland, an amateur magician who put on a magic show of professional calibre.—*Joseph J. Clark.*

Rochester

MONTHLY meeting of the Rochester Chapter of the A.F.A. was held Jan. 12 at the Seneca Hotel. The membership of the chapter has grown threefold during its first year of existence and is composed of leaders of the foundry industry throughout the area.

Following the dinner, Ralph T. Rycroft, Jewell Alloy & Malleable Co. Inc., Buffalo, a national director of the association, presented an interesting talk on the outlook of the foundry industry. Norman F. Hindle, director, technical development program of the A.F.A., described the functions and objectives of the association's many educational activities.

At the regular meeting held Dec. 16 the following new officers of the chapter were elected: President, Walter F. Morton, Anstice Co. Inc.; vice president, Walter G. Brayer, Bausch & Lomb Optical Co.; secretary-treasurer, Carl B. Johnson, Symington-Gould Corp. New directors include: David D. Baxter, Sterling Wheelbarrow Co.; Neal F. Clement, Rochester-Erie Foundry Corp.; and Henry B. Hanley, American Laundry Machinery Co.—*Carl B. Johnson, secretary-treasurer.*

Western New York

ABOUT 50 members of the Rochester Chapter of the A.F.A. braved the snow and cold weather on Feb. 3 for a joint meeting with the Western New York Chapter at the Hotel Buffalo. An informal reception was held before the two chapters sat down to an excellent dinner at 7 o'clock. Chairman Reinhold D. Loesch of Western New York Chapter welcomed the Rochester members and Walter F. Morton, president of Rochester Chapter, replied with a few well chosen words..

Past chairman Frank E. Bates announced the two foundry courses being given at University of Buffalo, sponsored by Engineering, Science and Management War Training Program of the U. S. Government, in "Modern Foundry Practice," on Monday evenings, and "Ferrous Foundry Metallurgy," on Tuesday evenings.

Charles W. Summers, humorist, of Buffalo, gave a very amusing talk, and the evening was brought to a close by a very enjoyable and entertaining floor show.—*J. Ralph Turner, secretary.*

Chesapeake

CHESAPEAKE Chapter of the A.F.A. held its annual roundtable meeting Jan. 24, at the Engineer's Club, Baltimore, following the usual satisfying refreshments and dinner. Chapter chairman, H. A. Horner, Frick Co., Waynesboro, Pa., introduced the leaders of the three groups into which the members were divided for discussion.

Andrew Shaw, Link-Belt Co., presided over a lively discussion involving cupola operation, casting cleaning, coke problems and miscellaneous gray cast iron foundry practice problems which attendant members of this group had encountered during the past year.

Paul Ade, Naval Gun Factory, was chairman of the group in which discussion hinged around gating and risering of brass and bronze and the casting defects usually encountered and their method of elimination.

W. Gross, American Radiator & Standard Sanitary Corp., assisted by H. F. Taylor, Naval Research Laboratory, headed the cast steel roundtable session. New and better methods of core drying were discussed, with considerable mention being given to the use of infra-red drying. The methods of carbon control in electric furnace melting, hardenability measurements, the ramming of sand for testing purposes and the stress relieving of castings also offered opportunity for lively discussion in this group.—*E. J. Hubbard, reporter.*

Northern California

NORTHERN California Chapter of the A.F.A. started the year with a meeting that drew a record crowd of 137 for dinner, Jan. 12, at the Engineers' Club, San Francisco. President Ralph Noah presided.

G. L. Bostwick and E. H. Schleede, United States Gypsum Co., were the guest speakers, presenting the subject "How To Make Patterns and Models with Gypsum Cement," with the aid of sound projecting equipment. Making patterns of plaster offered something new to all, but the old time patternmakers remembered the period when patterns for ornamental cast iron were produced by a like method 35 or 40 years ago.

Nate Weinger from Portland was given a big hand when it was announced that he had worked hard to organize the new A.F.A. chapter there.

After the gypsum cement picture and the question and answer period which followed, nonferrous foundrymen retired to separate quarters under the chairmanship of Don Caudron, Pacific Brass Foundry, where George E. Dalby, associate metallurgist, Mare Island Navy Yard, led 47 men in a discussion of his experiments in the "Absorption of Gases in Melting Brass and Bronze."

The gray iron foundry group of 23 men, under the direction of Harold Henderson, H. C. Macaulay Foundry Co., occupied one corner of the main room where Andrew Ondreyco of Vulcan Foundry Co. headed discussion of "Cupola Melting."

Ray Wilson, Pacific Steel Casting Co., found space for his 22 steel foundrymen in another corner of the room, where Phil Rodger of General Metals held to his subject, "Rigging for Steel Castings."—*Richard Vosbrink, publicity chairman.*

Northeastern Ohio

A THOUGHTFUL reference to the Dumbarton Oaks conference, particularly in its probable effect on the future history of the world was presented by Alfred Hotz, history teacher at Lakewood High School, at the Feb. 8 meeting of the Northeastern Ohio Chapter, A.F.A. He spoke of the bungling and mismanagement that marked the attempt to form a league of nations after World War I. However, the Dumbarton Oaks conference shows promise. Boiled down to its essentials it amounts to this: The participants represent the three most powerful nations in the world. They want peace. They have the means of enforcing peace —and that's that!

A comprehensive and highly interesting and instructive paper on the subject of Z-metal, a quick anneal variety of malleable iron with superior physical properties, was presented by Frederick J. Wurscher, metallurgical engineer, Semet-Solvay Co. Aided by the use of a number of excellent slides the speaker discussed the history of the development of the metal, progress since 1915, basic constitution, methods of manufacture and metallurgical phases of the metal. Several castings were displayed to demonstrate applications. Production of the metal is covered by a number of patents owned by the Ferrous Metals Corp., New York. Manufacture of the metal in any foundry is under license granted by the corporation.—*Pat Dwyer.*

Central New York

CENTRAL New York Chapter of the A.F.A. held its monthly meeting at the Onondaga Hotel, Syracuse, N. Y., Jan. 12, with Chairman L. E. Hall presiding. William Romanoff, H. Kramer Co., Chicago, was principal speaker on the subject, "Nonferrous Foundry Practice and Metallurgy."

Mr. Romanoff described briefly the method used in making copper alloy ingots, stressing that the basis of good ingot production depends on sorting and selection of scrap as well as constant chemical analysis. Selecting several of the most commonly used copper alloys, he de-

(*Continued on page* 145)

¶ Is your naturally bonded molding sand a little too weak?

¶ Do you lose production by drops and because the molders must "baby" the sand?

¶ Must you operate with dangerously high water content to get workability?

¶ Do you get cuts and washes?

¶ Must you use a large number of gaggers and nails?

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can cure your troubles!

¶ A very small addition of Dixie Bond will strengthen any naturally bonded sand. Molding is faster and scrap is lower. No mechanical mixing is required. *Ask for our bulletin on the use of Dixie Bond in heap sand.*

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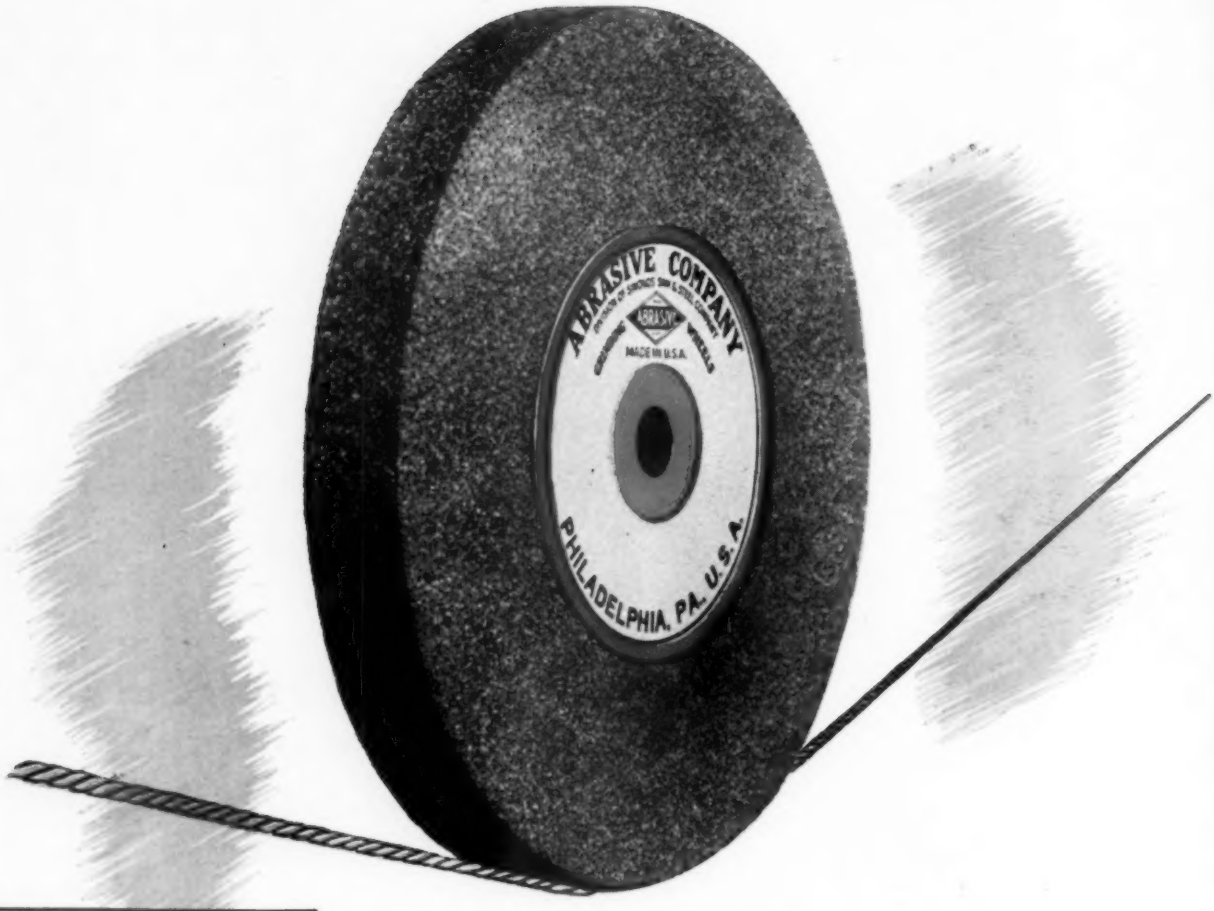
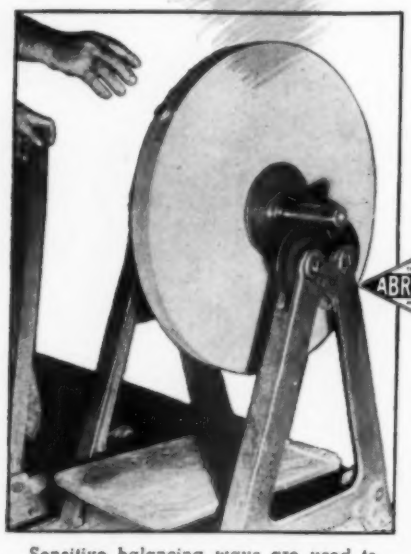


BALANCE



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Balance might be the one word to describe Abrasive Company excellence. Mechanical balance is essential for efficient grinding and is a "must" in every Borolon and Electrolon Grinding Wheel. Balance prevents vibration and chattering; and lengthens the life of valuable grinding machinery. Balance starts with selection of raw material, and the manufacture of abrasive grains. Hundreds of balanced formulas produce just the right bond for many combinations of grade and density. Balanced control of molding processes; balanced regulation of kiln heats and operation; balance in the finishing; and balance in tests and inspections are all basic to quality in Abrasive Company manufacturing.

Balanced inventories in factory stock and on distributors' shelves make Abrasive Electrolon and Borolon Grinding Wheels; Segments; Mounted Wheels and Points; Grains, Bricks, and Sticks available for your every specific abrasive requirement.

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ABRASIVE COMPANY • TACONY AND FRALEY STREETS • PHILADELPHIA 37, PA.

(*Continued from page* 142)

scribed correct foundry practices for each, and opened discussion on each alloy.

Mr. Romanoff spent considerable time on aluminum bronzes, suggesting that these alloys, due to their toughness, high tensile strength and corrosion resistance may be in competition with steel castings and forgings in the postwar period. Chrome-copper alloys were discussed and the speaker suggested that the best way to keep the chromium in the copper is to add the chromium to the melt after the metal has been deoxidized.—*John A. Feola, reporter.*

St. Louis

MONTHLY meeting of the St. Louis District Chapter of the A.F.A. was held Jan. 11, at the De Soto Hotel, with 89 members and guests in attendance.

E. E. Woodliff, Foundry Sand Service Engineering Co., Detroit, gave an interesting talk on various phases of sand problems, illustrating different points by means of charts. Mr. Woodliff advised that good results have been obtained with chrome oxide in mold washes for fine finish on steel castings and said that sand control is in the same category with metal control.

Nathan Janco, Centrifugal Casting Machine Co., Tulsa, Okla., was the guest speaker at the St. Louis meeting held Feb. 8, at the De Soto Hotel, which had an attendance of 113 members and guests. Mr. Janco illustrated his talk with slides and brought out the advantages of centrifugal casting in improving the quality and increasing the yield of the castings, both in ferrous and nonferrous work. However, in some cases, the static yield was sufficiently high not to warrant a change. A lengthy discussion period followed the talk.—*Charles E. Rothweiler, secretary treasurer.*

New Jersey

IN A strong appeal to foundrymen to adopt sounder and more uniform cost accounting methods, John L. Carter, cost consultant, Gray Iron Founders' Society, outlined the society's standard cost procedure to members of the New Jersey Foundrymen's Association at the Newark Athletic Club, Newark, N. J., at a meeting Jan. 24.

He discussed simple methods for small foundries and also more advanced measures for those desiring more accurate costs, and made the practical observation that cost systems in gray iron foundries are usually a compromise between accuracy and clerical expense.

Discussing the Gray Iron Founders Society's standard cost methods, he pointed out that they were first set up by a cost committee of the old Gray Iron Institute in 1930. Later, in the NRA days, they came in for a further check and were approved with only minor revisions. Thus, Mr. Carter pointed out, the society's cost methods have run the gantlet of three cost committees and, except for these minor revisions, have withstood the test.

In addition to describing various accepted principles in sound cost accounting, he also described some of the many unsound methods. Mimeographed charts were distributed to show how five different foundries, using five different methods of distributing overhead could arrive at five substantially different costs on the same job, even though their direct labor costs and actual overhead costs were identical. The disorganizing effect of these variations on the price structure was emphasized.—*Ben K. Price.*

Eastern Canada and Newfoundland

APPRENTICE Training on the Canadian National Railways" was the subject ably presented by A. H. Williams, general supervisor of apprentice training, at the January meeting of the Eastern Canada and Newfoundland Chapter, A.F.A.

Mr. Williams outlined the methods used in the selection of apprentices and the statistics he maintains to keep the number of apprentices in each trade in balance with the normal separations. It is his policy never to start more apprentices than the shops can absorb as journeymen, thus guaranteeing the boys jobs on completion of their training.

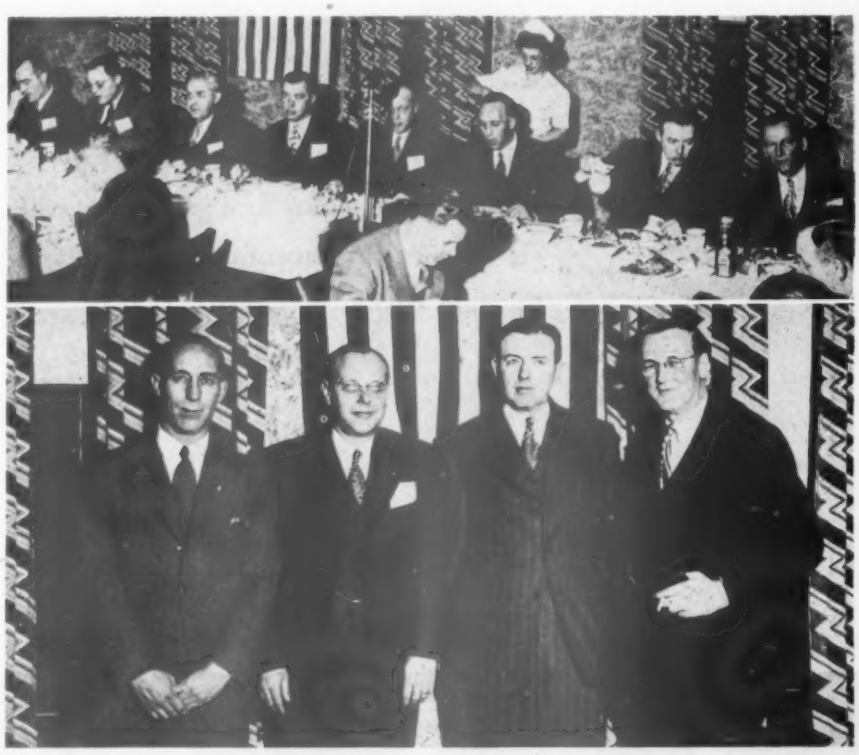
He went on to outline the shop and classroom training, covering a 5-year period, offered to boys in the various trades. The courses are designed to insure that the boys have an opportunity to work in every branch of their trade, within the scope of railway work. Two hours a week classroom study are provided for on company time, instruction being given in mathematics, drawing and trade theory.

Mr. Williams emphasized that the success of the training lay in having a definite schedule of shop work, special supervision and instruction, and supervisors who took a personal interest in the boys and offered them the encouragement which is so necessary if their interest is to be maintained. The boys are not kept as helpers, but given full responsibility for work within their capabilities.

At the conclusion of Mr. Williams' talk there was much discussion as to the reason why the railroad should have no difficulty obtaining the required number of apprentices for the foundry or any other trade, while general industrial foundries in the Montreal area were finding it almost impossible to attract boys. While various factors, such as following in their father's footsteps and somewhat better pay in the railway shops, are partly responsible, the boys probably give most consideration to the fact that they are offered a definite training program and to the fact that the railway offers continuity of employment. If the industrial foundries would or could offer the same advantages, it was thought they would have no trouble in attracting apprentices.

Henri Louette outlined the course of

(*Continued on page* 148)



SAGINAW VALLEY: *Views taken at the Feb. 1 meeting of the Saginaw Valley Group, A.F.A. Shown below, left to right, are: Charles Morrison, group chairman; Fred J. Walls, national A.F.A. vice president; A. L. Boegehold, General Motors research metallurgist, and James N. Smith, general manager, Saginaw Malleable Iron Division*

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You'll automatically eliminate a constant source of trouble and many casting failures when you standardize on Hines "Pop-Off" Flasks. There are no sand strips—serrations on the inside surface of these flasks anchor the sand firmly in both the cope and drag—no chance for sag or drop—definitely prevents shifts in castings. The waffled design imparted on the sand facilitates perfect venting of the mold. You'll never need pound or maul this flask to remove it—simply release the levers and off it "pops". Fixture-built, extremely accurate and interchangeable. Made of aluminum, it retains this accuracy and outlasts other so-called light-weight flasks.

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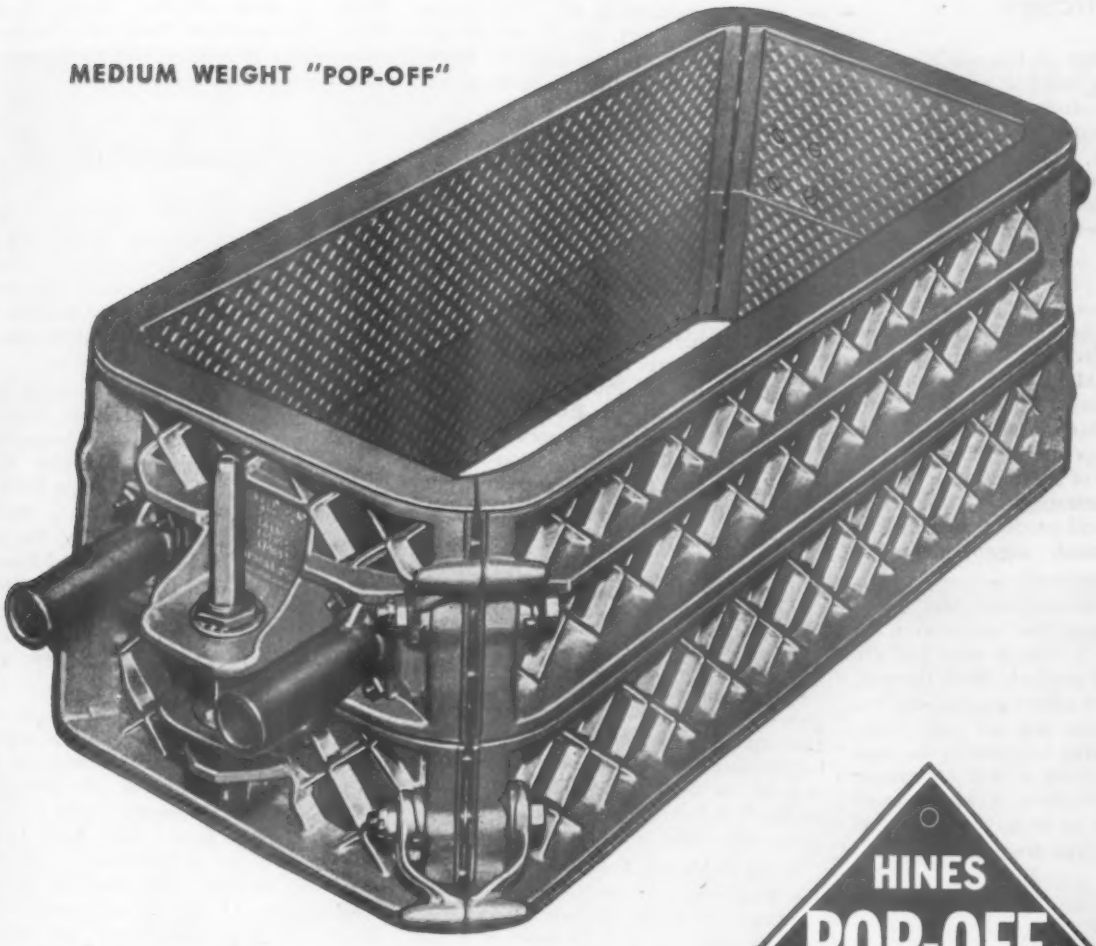

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FLASK

FLASK CO.

CLEVELAND 7, OHIO

(*Continued from page* 145)

five lectures on "Fundamentals of Foundry Practice" which is to be given by the educational committee in February and March. E. N. Delahunt, chairman of the Regional Conference committee, spoke of the arrangements being made for a conference in Montreal on May 16-17. A program of talks, group discussions and plant visits is being arranged. Sufficient accommodation has been secured for all those who may wish to attend, but Mr. Delahunt emphasized that reservations should be in his hands as soon as possible. —*G. Ewing Tait, publicity chairman.*

Chicago

UNDER impetus of the war demand for castings, interest runs high in finding better production methods. This was clearly indicated Feb. 5 when the Chicago Chapter, A.F.A., sold out its limit of 300 dinner places at the Chicago Bar Association for a meeting headlining "Progress with Better Methods and Motion Study."

The program, presented by James H. Smith, general manager, and Stuart D. Martin, production manager, Saginaw Malleable Iron division, General Motors Corp., Saginaw, Mich., took the form of coremaking demonstration, with Mr. Smith doing the narrating and Mr. Martin performing the operations. This was followed by a series of slides of other foundry operations illustrating how work had been simplified and production increased significantly through improvements in practice and equipment.

By way of introduction, Mr. Smith stated his company had undertaken its program because a definite need had developed for better methods. With the war, this need assumed added significance, for adequate manpower has not been available. Digressing for a moment, he read several passages from a War Manpower Commission publication which referred to foundry work in terms which would discourage a worker from seeking such employment.

Improved methods, Mr. Smith declared, is a management responsibility, and in their fundamentals involve an arrangement of tools and materials. At this point, the demonstration started—that of making a simple core in a corebox designed to make four at one time. The core bench was of customary type with materials and tools placed on it in what would normally be considered convenient arrangement. Timed by stop watch, Mr. Martin turned out six sets of cores in 2.45 minutes, or at the rate of 480 per hour.

Following this, Mr. Smith pointed out bad features of the setup. These included the fact that the table was too low, causing the coremaker to lean forward; sand had to be scooped up by hand; tools were improperly placed; the plate on which cores were deposited was inconveniently positioned, etc. To improve the setup, the core table was raised 4 inches; sand was placed on a small platform above the table to be pulled off into the corebox; tools were respotted within closer working range; and the depositing plate was placed on an angle at the left of the bench.

Under these new conditions, and substituting jolting for peening, Mr. Martin made six sets of cores in 1.65 minutes, or at the rate of 780 per hour. Over the old procedure, the increase in production was 62½ per cent.

Slides shown subsequently gave examples of how corresponding increases in production were obtained in plate molding, breaking off gates and sprues, removing castings from malleablizing pots, grinding, and similar operations. The improvements were derived principally by proper positioning of tools, proper placing of containers, use of storage bins and conveyors, use of high-lift trucks with dump buckets, better lighting, and other devices.

An outstanding discovery made in the improving of methods was that women can perform many of the operations which formerly could be handled only by men. This has gone a long way toward solving the manpower shortage.

Next meeting of the Chicago Chapter, to be held March 5, will be the third in the roundtable series. Topics scheduled for discussion are: Gray Iron division—"Practical Foundry Problems"; Malleable division—"Boron and Its Effects upon Physical Properties and Annealing Characteristics"; Nonferrous division—"Magnesium Foundry Control;" and Steel division and Pattern division—joint meeting on "Patterns."—*Erle F. Ross.*

Southern California

TECHNICAL discussions of plaster patterns, use of inoculants to improve granular constituencies of gray iron castings and new methods in bronze casting production featured the monthly meeting of the Southern California Chapter of the A.F.A. held Jan. 19 at the Los Angeles Elks Club.

E. H. Schleede, United States Gypsum Co. engineer, told his audience that advantages in using gypsum cements for making patterns and models lay within the scope of five main divisions. These he enumerated as (1) saving in time, (2) accuracy and stability of dimensions, (3) adaptability to complex shapes, (4) ease of producing sectional dies from full scale mock-ups, and (5) flexibility in making check fixtures and complicated mock-ups and gages of irregular shapes.

Rebecca H. Smith, metallurgist now associated with the Northrup-Hendy Co., Hawthorne, Calif., gave a 15-minute, slide-illustrated talk on the techniques of using admixtures of various compounds or elements in small quantities in alloys of gray iron. Substance of Mrs. Smith's highly technical discussion was that gray iron foundries have not yet learned to take full advantages of recent advances made in inoculation of alloys so as to augment strength and machinability.

Heading the discussion in a separate group meeting on nonferrous metals was M. E. Greenhow, general manager of Olds Alloys Co., South Gate, Calif.

W. D. Bailey Jr., president of the chapter, announced that between 40 and 50 members had signed to take the course of lectures on foundry work to be heard weekly until the end of March.

Robert R. Haley, Advance Aluminum & Brass Co., has been elected vice president of the Southern California Chapter, succeeding E. M. Hagener, who has severed connections with the foundry industry. W. D. Emmett, Los Angeles Steel Casting Co., succeeds Mr. Haley as treasurer, and the former's unexpired term as director has been filled by Harold Pagenkopp, Angelus Pattern Works. J. B. Morey, International Nickel Co., has been appointed chairman of the entertainment committee.—*Maurice Beam.*

Philadelphia

REGULAR monthly meeting of the Philadelphia Chapter of the A.F.A. was held Dec. 8 at the Engineers' Club, Philadelphia, with more than 100 members and guests in attendance to listen to an "Information Quiz" program which proved interesting and instructive.

Dr. T. H. Nelson served as judge and the following members of other chapters served on the panel: Gray Iron—Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va.; Steel—Werner Finster, Reading Steel Casting Division, American Chain & Cable Co., Reading, Pa., and William Hoffman, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.; Nonferrous Metals—Robert E. Ward, Eclipse Pioneer Division, Bendix Aviation Corp., Bendix, N. J., and R. J. Keeley, Ajax Metals Co., Philadelphia.

When a question remained unanswered the author was entitled to a free admission ticket to any later meeting of the Philadelphia Chapter. It was necessary to call a halt to the meeting after 2 hours, or the chapter would have been totally in the red as far as free admission tickets were concerned. The meeting proved very successful and it is hoped that a similar program will be held next year.

On Jan. 12 the chapter had another successful meeting at the Engineers' Club. The session was entitled "A Forum on Nonferrous Metals," and the speaker was D. Frank O'Connor, American Saw Mill Machinery Co., Hackettstown, N. J. Technical Chairman was Dr. G. H. Clamer, the Ajax Metal Co., Philadelphia.

Mr. O'Connor, who is vice chairman of the A.F.A. Brass and Bronze Division, gave a general outline of nonferrous practices, predominantly brass and bronze, and showed that a few variables resulted in defective castings. Contributing to these are the poor heating of ladles used in pouring; overheating of metal in the furnaces; improper atmospheres in melting; incorrect pouring temperatures, etc. A few of the foundries in the Philadelphia area supplied fractures of defective

(*Continued on page* 174)

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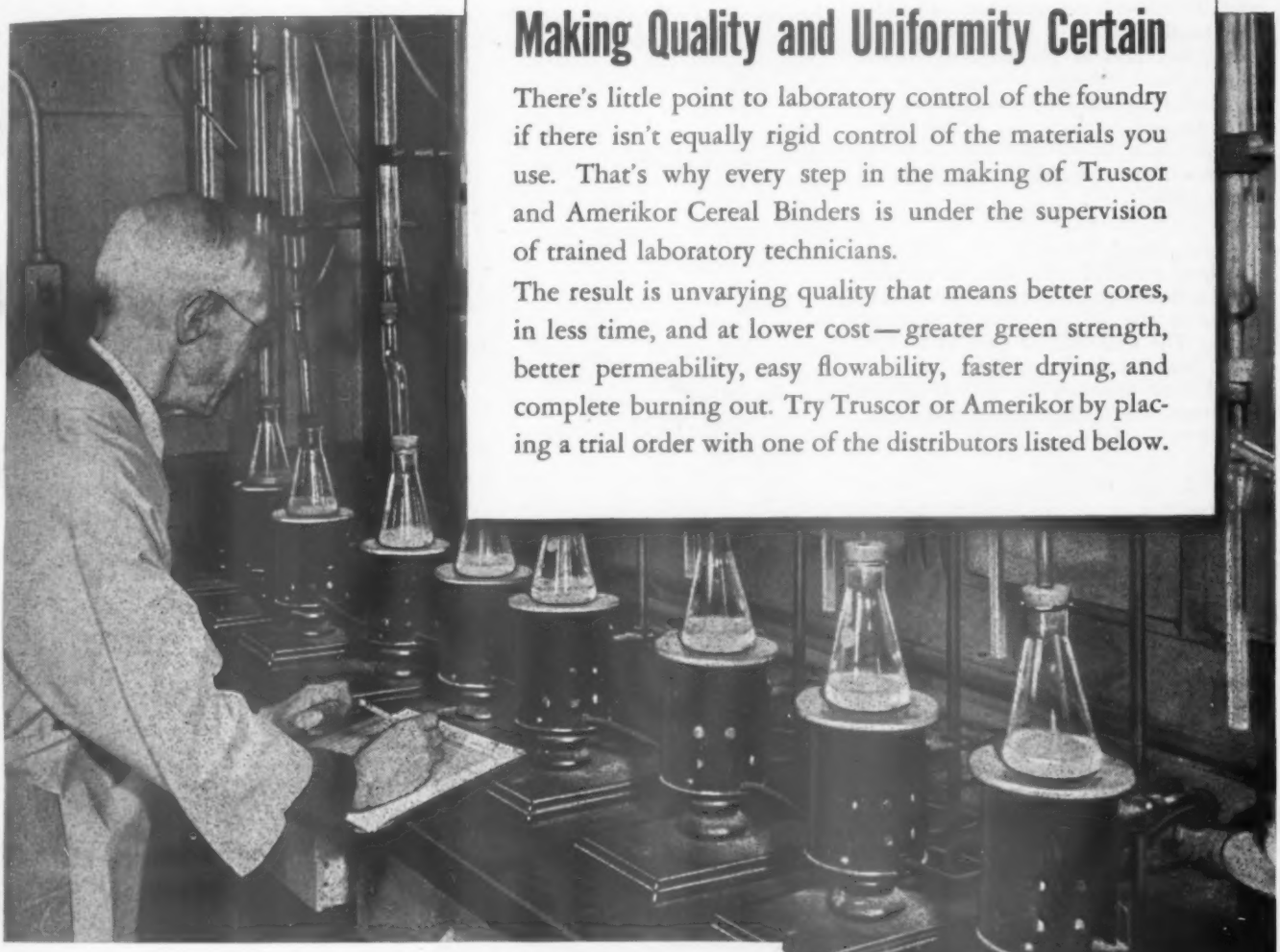
There's little point to laboratory control of the foundry if there isn't equally rigid control of the materials you use. That's why every step in the making of Truscor and Amerikor Cereal Binders is under the supervision of trained laboratory technicians.

The result is unvarying quality that means better cores, in less time, and at lower cost—greater green strength, better permeability, easy flowability, faster drying, and complete burning out. Try Truscor or Amerikor by placing a trial order with one of the distributors listed below.



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INDUSTRY ...Briefs

NEGOTIATIONS for the acquisition by purchase of Atwood Machine Co., builders of textile machinery, Stonington, Conn., by Farrel-Birmingham Co., heavy foundry products and machine manufacturers with plants at Ansonia, Conn., Derby, Conn., and Buffalo, are being closed. Franklin R. Hoadley, head of the Atwood company, has become president of Farrel-Birmingham. Merger is expected to be completed by April 1 without change in management or personnel at the Stonington plant, which was established in 1852 and has operated at Stonington since 1876.

• • •

International Harvester Co., Chicago, has been awarded a $45,000,000 contract by the War Department to build medium tanks of the 30-ton General Sherman type. The work will be done at Bettendorf, Iowa, in the Quad Cities Tank Arsenal now operated by the Harvester company. Production is expected to get under way in June.

• • •

C. S. Bell Co., Hillsboro, O., plans construction of a new plant to include five buildings, to replace its present foundry. The company, now engaged in manufacture of bells chiefly for the Navy, has been in business 87 years.

• • •

Lehigh Foundries Inc., Easton, Pa., has been granted WPB permission to construct an addition containing 30,000 square feet floor space and install machinery and equipment for production of mortar shells, to cost $1,240,000.

• • •

Magic City Foundries, Muncie, Ind., plans erection of a new foundry plant at Ohio avenue and C. & O. railway, 100 x 200 feet main building, to cost over $40,000, with equipment.

• • •

Crawford Steel Foundry Co., Bucyrus, O., has received WPB approval for addition of shakeout and sand-handling equipment, to cost $56,065.

• • •

Detroit Brass & Malleable Works, 100 South Campbell avenue, Detroit, has let contract to Austin Co. for a plant building to cost about $40,000.

• • •

Atlas Foundry Co., Detroit, has let contract to W. F. Demske for a foundry addition costing about $40,000.

• • •

The Emery Floor Co. Inc., 330 West 42nd street, New York, has been organized to lay industrial floor toppings of emery aggregate produced by Walter Maguire Co. Inc., New York, with whom the new company is associated..

• • •

Sully Brass Foundry Ltd., 7 Wabash avenue, Toronto, has requested bids through E. I. Davidson, architect, 36 Toronto street, Toronto, for foundry at Long Branch, Ont., estimated to cost about $50,000 with equipment.

• • •

Progress Pattern & Foundry Co., 1457 Marshall avenue, St. Paul, has let contract to Peter Kammerer for a one-story factory addition 58 x 90 feet, to replace plant recently burned with loss of $60,000.

• • •

Skilsaw Inc., Chicago, has received for the fourth time the Army-Navy "E" in recognition of continued achievement in producing materials essential to the war effort.

• • •

Haberfelde Steel Co., Bakersfield, Calif., has been granted a building permit for reconstruction of its foundry building at 2200 S street, recently destroyed by fire, at a cost of $17,000.

FOURTH STAR: *Capt. James C. Byrnes Jr. USN (Ret.) presents fourth Silver Star Navy "E" Award to Elmer F. Twyman, general manager, Automatic Transportation Co., Chicago, for excellence in production of electric propelled material handling equipment used in handling navy and army ammunition and supplies*

Contract has been awarded for construction of alterations and improvements to Renfrow's Gray Iron Foundry, Los Angeles, at an estimated cost of $8000. The contractor is Pozzo Construction Co., Los Angeles.

• • •

Vierling Steel Works, Chicago, suffered fire damage estimated at $150,000 Feb. 9 when one of its six buildings was destroyed following a series of explosions in the paint trough. Sparks fired the roof of the adjoining gray iron foundry.

• • •

David J. Miller and L. R. Lenhart are opening a new brass and aluminum foundry, to specialize in bronze ship fittings and gun mount parts, in Omaha, Nebr. Essential civilian items including railroad specialties will also be handled.

• • •

Superior Mill & Foundry Supply Co. is the firm name under which Louis Anderson, John Cohen and Jay Cohen have published a certificate that they are conducting business at 553 South Western avenue, Los Angeles.

• • •

Fifteenth Street Foundry is the firm name under which Pedro Cuevas has published a certificate that he is conducting business at 2268 East Fifteenth street, Los Angeles.

• • •

Building permit has been issued for construction of an addition to the foundry building of the Howell Foundry Co., Los Angeles, to cover an area of 30 x 50 feet and to cost $2500.

• • •

Fire caused extensive damage to the plant of the Federal Mogul Corp., Detroit, Jan. 12. The interior of the spring room and the rear of the foundry were destroyed.

• • •

Thew Shovel Co., Lorain, O., was awarded the Army-Navy "E" at plant ceremonies Jan. 12, in recognition of outstanding production of power cranes and shovels for the armed forces.

• • •

Algoma Foundry & Machine Co., Algoma, Wis., manufacturer of hammer mills, feed cutters, etc., plans a one-story foundry addition 75 x 100 feet.

• • •

Dayton Malleable Iron Co., Dayton, O., has been given WPB approval for a two-story addition for machine and carpenter shop, etc., costing $131,000.

• • •

Loss estimated at $2,200 was sustained when the Cast-Rite Foundry, Decatur, Ill., burned Jan. 11. The fire was caused from an overflow oil supply.

• • •

Mall Tool Co., Chicago, has been granted a third renewal of the Army-Navy "E" for excellence in war production.

SPECIFY "GENERAL CHEMICAL"

...dependability and uniformity in metal chemicals

STEEL

PICKLING . . . Sulfuric Acid—Hydrofluoric Acid—Muriatic Acid—Nitric Acid—Phosphoric Acid—Chromic Acid.

Detergents: Sodium Metasilicate—Trisodium Phosphate—Sodium Silicate—Tetrasodium Pyrophosphate.

RIMMING STEEL . . . Sodium Fluoride for smoother surface rimming steel.

COKE BY-PRODUCTS . . . Sulfuric Acid for making Ammonium Sulphate; for washing toluene, benzene, and for treating light oils.

FOUNDRY

Casting Cleaning Acid (Hydrofluoric Acid)—Sodium Silicate—Zinc Chloride—Polyacid Fluorides—Chromic Acid.

Sodium Fluoborate—Ammonium Fluoborate—Potassium Fluoborate, antioxidants and inhibitors.

Potassium Fluoride—Lithium Fluoride and other welding fluxes.

Fluoboric Acid: Solvent for silica, in cleaning surfaces.

HEAT TREATING

Sodium Cyanide—Sodium Fluoride—Sodium Cyanate—Potassium Cyanate.

METAL and ALLOY PLATING

Lead Fuoborate—Tin Fluoborate—Zinc Fluoborate—Cadmium Fluoborate—Copper Fluoborate, etc.

FOR METAL ANALYSES: **BAKER & ADAMSON REAGENTS AND FINE CHEMICALS**

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NEW EQUIPMENT & SUPPLIES

(1)—Spark Suppressor: Whiting Corp., Harvey, Ill., has developed a cupola spark suppressor designed to eliminate danger from falling sparks, flames and smoke, and keep roofs free from fly ash, cinders and coke breeze. Suppression is accomplished by passing the gases through the special disintegrator section where they are mixed with water and subsidiary air from a blower. The equipment is said to capture 95 per cent or more of the solids, washing them down to a settling tank. All smoke and gaseous matter pass through a powerful cyclonic air and water swirl, and the small amount of smoke coming from the top of the stack is light in color and free from sparks and fly ash.

(2)—Safety Goggle: American Optical Co., Southbridge, Mass., announces a new improved safety goggle (left) which provides additional eye protection, increased ventilation and greater comfort because it is considerably larger in area and more face conforming than the previous cup (right). A natural draft to prevent lens fogging is made possible by air channels in the edge of the eye-cups, plus extra side perforations. The goggle is available with various types of lenses.

(3)—Fillet Cement: Kindt Collins Co., 12651 Elmwood avenue, Cleveland, is offering a new waterproof fillet cement for patternmaking. Because of its simplicity of application, it is said to save time and labor in the pattern shop, and because sand will not stick to the edges of a fillet on which it has been used, it will help to produce smoother castings and save time in foundry cleaning room. The cement employs neither water nor alcohol as a solvent, and is impervious to moisture. It is equally efficient when used on wood or metal patterns.

(4)—Rotating Furnace: Pacific Co., 8881 Central avenue, Detroit 4, announces a rotary tilting furnace for melting aluminum, developed by Paul Romph and claimed to be a rapid melter with low cost operation and decided improvement in quality of metal. Important features include: Maximum fuel saving, ease of operation, compactness and long life, low maintenance cost, and improved foundry conditions. The outer globe-shaped shell is welded steel construction. Melting pot, enclosed by the outer lined shell, is special alloy cast iron, trunnion supports are heavy cast iron, and two standard burners are located in the base of the furnace. Fuel may be gas or oil. Practically all heat is utilized for melting, but the metal is not exposed to the flame. A typical 3000-pound heat of aluminum is melted in 136 minutes at 1400 degrees Fahr. at the rate of slightly more than 1 cubic foot of gas per pound of metal. In case of pot failure the heat is not lost; it is only necessary to rotate the pot to another position and continue melting.

Mold Spray: Hercules Powder Co., Wilmington, Del., announces a new solvent-type mold spray applicable to the production of steel, iron, and nonferrous castings. It can be applied by either a spray gun or paint brush, and is then ignited and allowed to burn off the mold. The spray, known as Truline Mold Spray 91, is made from a special resin dissolved in a quick-burning solvent, and upon burning it leaves a thin film of resin upon the mold, thus strengthening, hardening and drying the mold surface in one operation. It is said to work equally well on either natural or synthetic bonded molding sands.

Mallets, Hammers: Greene, Tweed & Co., Palmetto building, New York 66, has placed on the market mallets and replaceable face hammers with aluminum heads and faces for applications where a soft faced striking tool is required. Tools are spark-proof and easily machined for refacing, and are not brittle and do not chip.

Fork Trucks: Elwell-Parker Electric Co., Cleveland 14, has designed power industrial trucks with interchangeable swivel forks to handle a wide range of products. It is claimed that only a few minutes are required to change from one fork to another. In addition to the

(*Continued on page* 154)

Mo-lyb-den-um is the "miracle mineral," used in making steel alloys of exceptional hardness, toughness and wear-resistance. A "Magic Mountain" in the Rocky Mountains of Colorado, provides the mo-lyb-den-um for Wood's own special analysis Mo-lyb-den-um alloy steel used exclusively in Moly shovels, spades and scoops.

Moly Shovels are normally made in all types, styles and grades needed for every variety of industrial use. Learn to know Moly, unconditionally guaranteed to outwear and out-last any other shovel made.

Illustrated: Moly Closed-Back Moulders Shovel—with Steel I-Beam Handle Reinforcement.

The WOOD SHOVEL and TOOL CO.

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A national organization specializing *exclusively* in shovels, spades and scoops.

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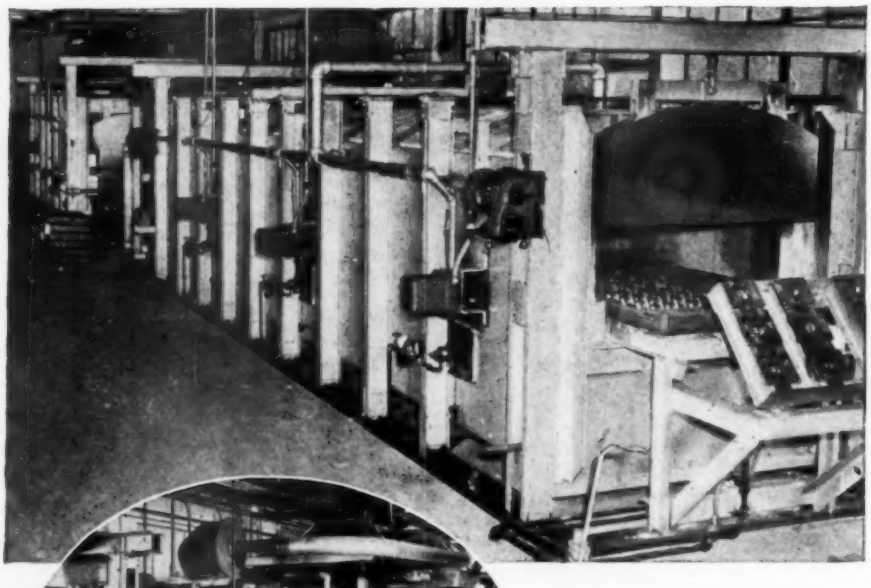
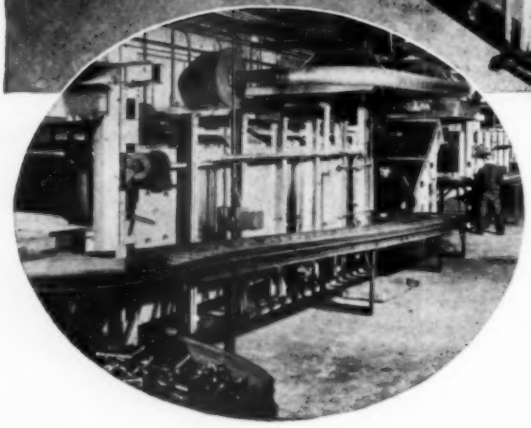
MO-LYB-DEN-UM ALLOY SHOVELS

VULCAN... CONTINUOUS HARDENING, QUENCHING, DRAWING UNIT





For Treating Miscellaneous Castings and Forgings . . .

PRODUCTION: 1000 lbs. to 1500 lbs. per hour. Engineered by VULCAN to provide fast, efficient operation, with maximum economy. Hardening furnace has roller rail and hydraulic pusher, and operates at temperatures from 1400°F. to 1800°F. It may be oil or gas fired, with two-zone control. Ball-bearing roller conveyor (lower view) returns trays from discharge end to charging end for reloading.

Draw furnace is roller rail, pusher design, with three-zone automatic temperature control, operating at 600°F. to 1400°F. Equipped with same type conveyor as hardening unit, for return of trays.

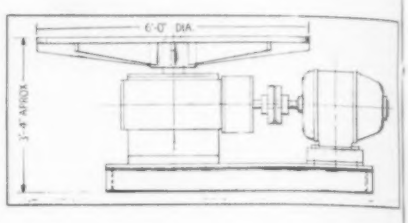
Although VULCAN Furnaces are engineered to meet specific requirements, they generally cost no more than those of standard design. Consult us regarding your heating and heat treating needs.

VULCAN CORPORATION
1797 CHERRY STREET, PHILADELPHIA, PA.

(*Continued from page* 152)

forks numerous appliances for handling, transporting and dumping materials have been developed.

Centrifugal Machines: Aimes Engineering Co., 1783 East Eleventh street, Cleveland 14, has designed a number of centrifugal casting machines for steel and nonferrous foundry applications. One for the production of large steel gears, shown in the accompanying sketch,

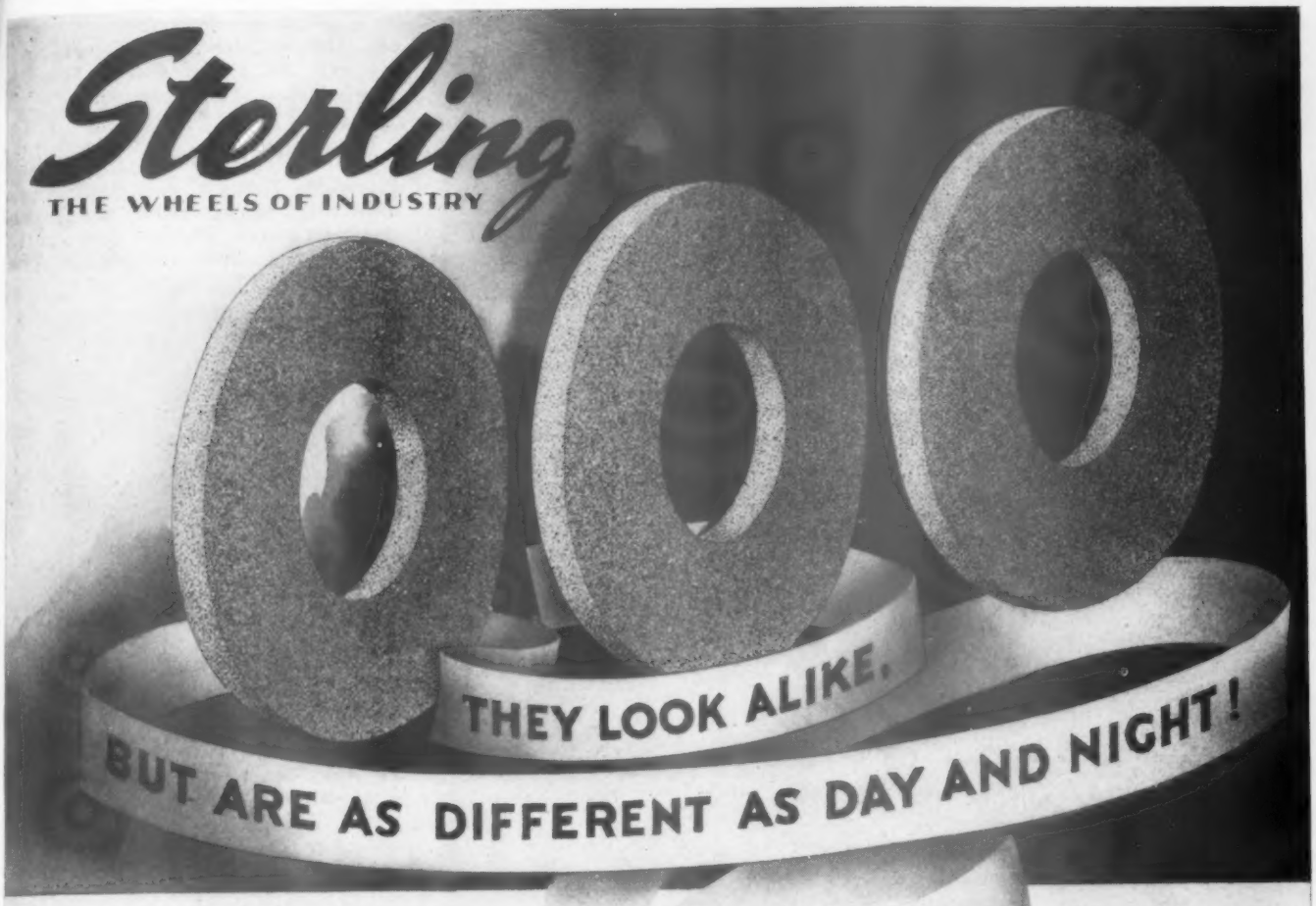


will take a mold load of 10,000 pounds and swing a flask 48 x 48 inches. Designed for static pouring and then spinning, or spinning at low speed while pouring and then rapidly increasing speed, the unit has a speed range from 20 to 300 revolutions per minute. Another designed for casting aluminum bronze or gray iron in permanent or sand molds incorporates an air cooling system to keep bearings and spindle cool, as well as an ejector to remove the castings from the mold. Electronic control is used and speed range is from 200 to 2200 revolutions per minute.

X-Ray Cabinet: Picker X-ray Corp., 300 Fourth avenue, New York 10, has developed the rayproof X-ray inspection cabinet shown in the accompanying illustration for continuous examination of

parts on a production schedule. As indicated, castings to be X-rayed are set up on trays outside the exposure chamber. Cabinet is arranged so that on completion of the exposure period, the tray bearing the radiographed parts is ejected simultaneously with the entry of a new one. Central exposure chamber is equipped with rayproof sliding doors and safety switches for protection of operat-

(*Continued on page* 156)



Many of Sterling's "Wheels of Industry" are alike in size and shape, but are vastly different when bond and abrasive grain are considered. The quality that Sterling technicians have put in these wheels is unseen, but it is there!

Sterling bonds, for example, come in for much study. Bond—the "cement" that holds the abrasive grains together—must be planned according to the demands of each grinding job. If it is a tough piece of work, the bond must release the dulled abrasive grains at the correct instant to expose the new, sharp abrasive. If soft materials are being ground, the bond must retain the grains until the last effective cutting action has been secured.

Your Sterling Grinding Wheels last longer and do better jobs because of the unusual attention we give to producing the correct bond for every wheel. Your grinding jobs are no exceptions —Sterling engineers, skilled by years of experience, can recommend correct bonds that may increase your production at no added cost. Write!

Glass Shatters Upon Impact . . A Good Wheel Bond Does Not!

The shock of wheel impact against the work calls for specially designed Sterling bonds. Unlike common glass which is strong but brittle, Sterling bonds do not shatter prematurely under the shock of grinding action . . . they stand up to the job.

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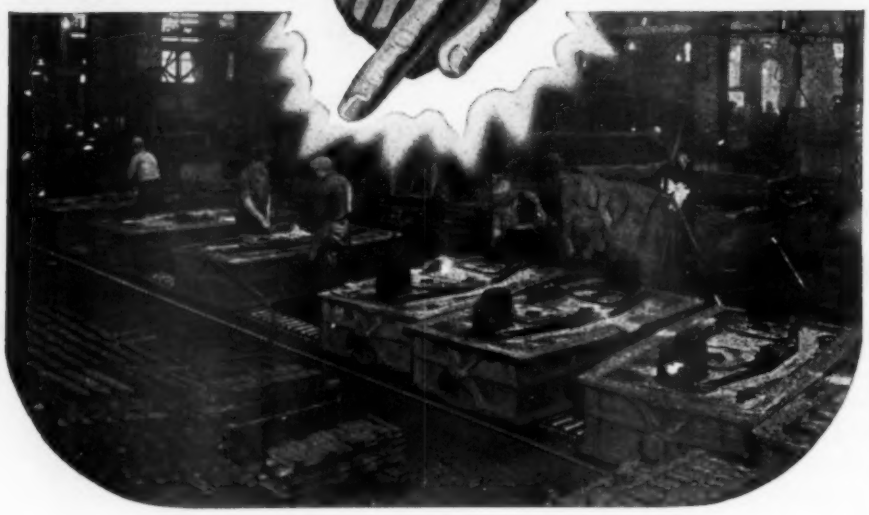

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Conveyors and conveyor systems, adapted to your particular operations, speed up material and commodity handling activities, pull handling costs down to an economical level, speed the flow and movements of production. Conveyors handle a wide range of commodities — parts, packages, units, cartons, cans, bottles, barrels, bundles, drums, boxes. They are built in light, average, or heavy-duty types for either portable or stationary use—in a wide variety of sizes, styles and lengths.

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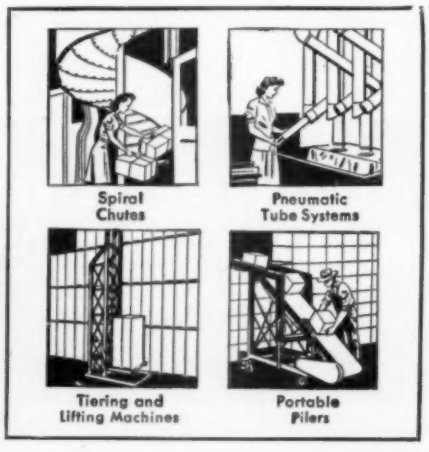


(*Continued from page* 154)

ors. Cabinet interior takes a parts-holding tray 18½ x 30½ inches. The film tray holds two 14 x 17-inch films.

Pneumatic Saw: Cleveland Pneumatic Tool Co., Cleveland 5, has developed a baby pneumatic saw for cutting sheet metal. The saw shown in the accompanying illustration will rip sheet

steel, brass, aluminum, etc. up to 3/16-inch thick. It is said to cut 1/16-inch thick steel at the rate of 1 inch per second on a straight or curved line, leaving the edges free from burrs. Cutting saw is special steel, heat treated for the purpose. Tool weighs 2¾ pounds and is about 8 inches long.

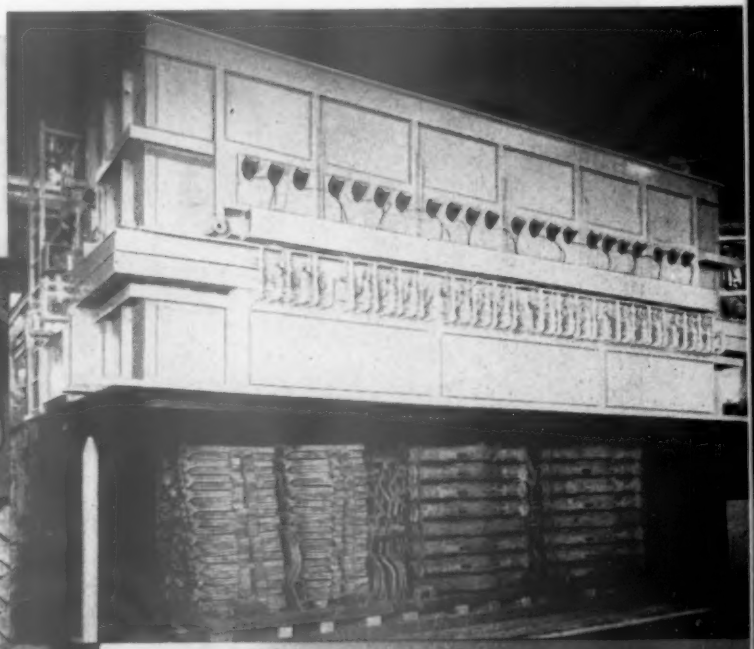
Magnifier: George Scherr Co., 200 Lafayette street, New York 12, has developed the new illustrated magnifier shown in the accompanying illustration, to simplify and speed up visual inspection operations. The magnifier is encased

in an aluminum alloy casting. The lens, manufactured of high grade optical glass, is 5 inches in diameter to give a clear undistorted view of the object under inspection. Housing is fastened to a 16-inch upright rod extending from the base by a universal clamp which permits swivelling. Base of the device is a triangular 12 x 12 x 12-inch iron casting, and in-

(*Continued on page* 158)

A WILSON Rectangular Bell Furnace Application for Malleableizing Iron Castings at The Eastern Malleable Iron Co., Wilmington, Del.

● A Wilson Gas Fired Rectangular Bell Type Furnace — Gas Tight Casing. Atmosphere self-generated from the contained carbon in the cast metal.



● Fired with Wilson Vertical Radiant Tubes for low fuel consumption. Uses any type of industrial gas.

● Eastern Malleable Iron Co.'s excellent loading method makes for heavier charges, lower fuel cost per ton, quick handling, more heats per year.

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The Wilson Annealing Unit is covered by Patents Nos. 1,952,402, 2,068,477, 2,078,356, 2,081,612, 2,089,843, and other patents pending

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Mulbaro is comprised of two sections . . . top section contains mulling mechanism which lowers down onto mulling barrow containing sand to be mulled. Portable . . . versatile . . . low-cost, efficient mulling . . . *that's* the Mulbaro!

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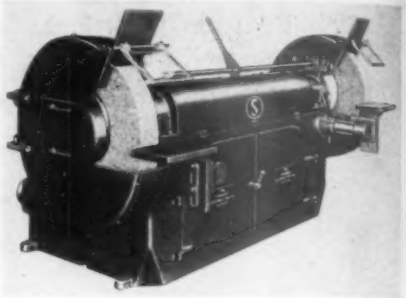
(*Continued from page* 156)

strument is equipped with two 4-inch, 25-watt tubular bulbs silvered to reflect the light to the work.

Snagging Grinder: Standard Electrical Tool Co., Cincinnati 4, is producing a new heavy-duty, double end snagging grinder shown in the accompanying illustration. Machine has four speeds of 1200, 1375, 1675 and 1950 revolutions per minute to maintain a peripheral speed of 9500 feet per minute on



the two 30 x 5 resinoid bond wheels. Interlocking speed control prevents overspeeding. Ball bearing motor is 30 horsepower and power is transmitted to wheel spindle by multiple v-belt drive. Boilerplate steel guards are adjustable to wheel wear by rack and pinion movement through a built-in ratchet wrench. Equipment includes adjustable spark breakers, eye shields, and heavy duty work rests. Wheel flanges are 15 inches in diameter for 12-inch bore wheels. Overall spindle length is 92 inches with a height of 33½ inches. Base measures 42 x 75 inches, and net weight is 5460 pounds.

Goggle: Welsh Mfg. Co., Providence, R. I., is distributing a new type of safety goggle which is claimed to be fog and dust free. The goggle shown has a

bulbous nosepiece which harnesses normal breathing to ventilate the goggle, removing moisture before it can condense on the lens. Lens is plastic, and the air intake ports of the goggle are fitted with replaceable felt filter pads to remove dust. Inhalation draws air through intake ports, across inside of the lens and through inlet valve into the nose. Exhalation closes in-

(*Continued on page* 161)

Mexaloy Super Refractory Saves Linings and Equipment

Tough, non-fusible protective lining for ladles, spouts, runners and cupolas

Mexaloy is the ideal material for protecting refractory linings of cupolas, ladles, runners and spouts in both foundries and steel plants. Mexaloy makes the body containing it highly resistant to sudden, violent temperature changes and thus avoids spalling and cracking of the refractory. Practically infusible, it will not melt or change its character under the action of molten metal. Neutral and chemically inert, Mexaloy's presence insures resistance to fluxing and corrosive action by molten metals and slags. It provides a low-friction, surface which allows no foreign body adherence.

Mexaloy is extremely easy to apply. Mixed with clay, ground fire brick and water according to a simple formula, the resulting mixture is easily applied by tamping. Linings containing Mexaloy last longer. For example, in the spouts of open Hearth furnaces where the usual loom layer has to be replaced after every one or two heats Mexaloy linings invariably last more than 10 heats—sometimes as many as 30. In Foundry cupolas Mexaloy linings last longer and improve metal quality.

To greatly reduce "shut downs" in your steel plant or foundry due to refractory replacements, it will pay you to use Mexaloy. Write today for further information.

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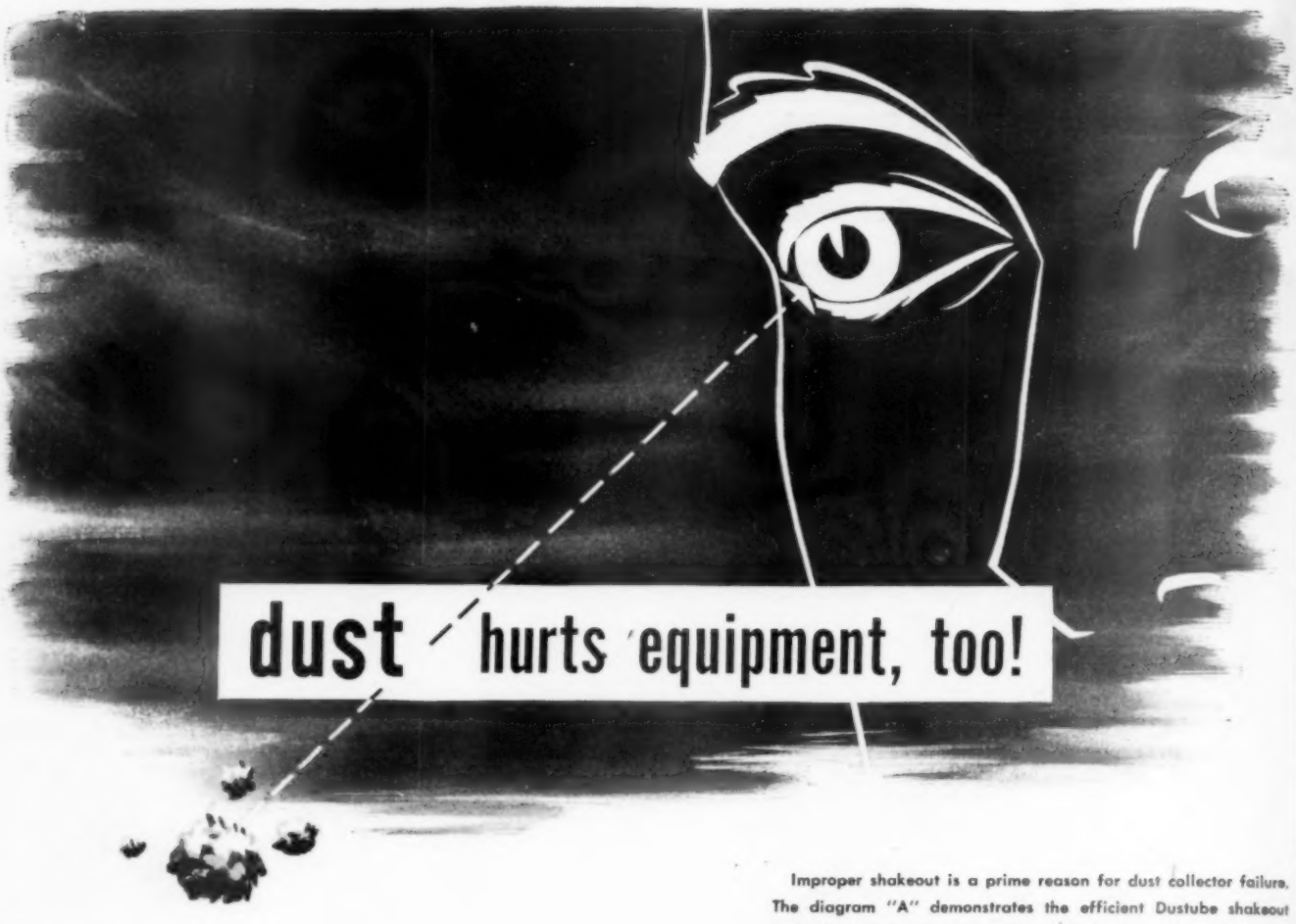

Dust, uncontrolled in your plant, is many times more harmful to your equipment and production than it is to the human eye. Why doctor dust-damaged equipment when the cause of the damage can be checked at its source? An American Dustube engineer can quickly show you how to eliminate the costly penalties dust inflicts. He can quickly show how American Dustube Collectors efficiently trap and effect its safe, easy disposal. There is an American Dustube dust collector of a size and type to handle the dust problem that exists in your plant. The last word in improved design, Dustube offers you many advantages through efficient operation, easy installation and inspection. Fewer working parts create a minimum of maintenance.

Improper shakeout is a prime reason for dust collector failure. The diagram "A" demonstrates the efficient Dustube shakeout method. Tubes are limp and deflated, completely subject to the shaking action. Dust is not precipitated on other filters, but is deposited directly into the hopper below. With Dustubes, shakeout periods are shorter and less frequent . . . filter tube wear is decreased.

Figure B. Dustube Collectors filter air at a rate from 270 CFM to 47,000 CFM and more, depending on the dust problem. Proved collection efficiency by weight is 98% or more.

Figure A

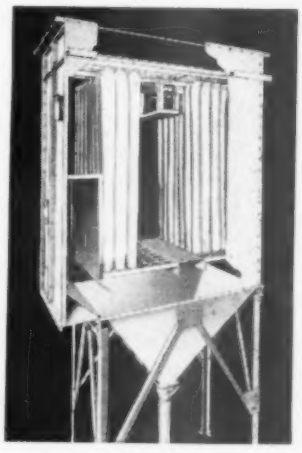

Figure B

AMERICAN
FOUNDRY EQUIPMENT COMPANY
505 SOUTH BYRKIT STREET · MISHAWAKA, INDIANA

AMERICAN dustube dust collectors

(*Continued from page* 158)

let valve and opens outlet valve in base of protruding nosepiece.

Weighing Scale: Yale & Towne Mfg. Co., Philadelphia Division, Philadelphia 24, has designed a unit weight cabinet attachment which is claimed to answer industrial requirements for high gross weighing capacity scale with low and accurate fractional dial chart graduations. The scale is equipped with stand-

ard dial mechanism, swivel head, tare and capacity beams and drop weights. By rotating handle on the left of the cabinet from 1 to 7 unit weight increments, each equivalent to the dial chart capacity, can be added to the lever system to increase the gross weighing capacity of the scale. Weight increments are indicated in a target on the dial chart. Flexible cables connecting the target to the drop weight mechanism allow the dial head to swivel to any desired position.

Face Shield: Chicago Eye Shield Co., 2300 Warren boulevard, Chicago 12, has designed a new type face shield which simplifies visor replacement. As may be seen in the accompanying illustration per-

forations in the visor fit snugly over small lugs. Spring clamps at each end hold the visor in place. For release a turn of the finger snaps out the old visor, and a new one is slipped into position. Visor is a tough, noninflammable plastic which protects head and neck, fitting snugly against the chest to prevent entrance of particles from beneath. Shields are avail-

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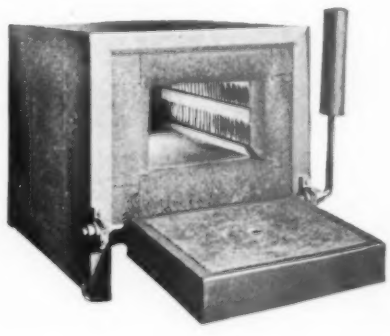
able in four styles including open-top headgear, half crown head gear, and helmet-like top and bottom guards.

Surface Plate: Machine Products Corp., Detroit 12, is making a new round surface plate 102 inches in diameter. Designed and built primarily for checking gun turrets, the cast plate

weighs 2½ tons and is approximately 18½ inches deep. Shown in the accompanying illustration, the surface plate is constructed on the rib design, and the face is precision scraped.

Generators: Construction Machinery Co., Waterloo, Iowa, has added a complete line of electric generating sets available in 65 basic models ranging in capacity from 350 to 25,000 watts. They are manufactured especially for the company and will be available through its distributors. Each unit is compact, portable and engineered for rugged service.

Furnace: Harold E. Trent Co., Leverington avenue and Wilde street, Manayunk, Philadelphia 27, has redesigned its bench type electrically heated furnace for laboratory and toolroom operation. Shown in the accompanying illustration, the furnace may be controlled



manually or automatically, and may be operated continuously at 1850 degrees Fahr., or intermittently at 2000 degrees. Outer casing is reinforced steel, and is lined with several layers of insulation. Welded steel door is lined with brick, and uses quick acting lever. Inside dimensions of furnaces vary from 5¼ x 3¾ x 12 inches to 12 x 9 x 21 inches.

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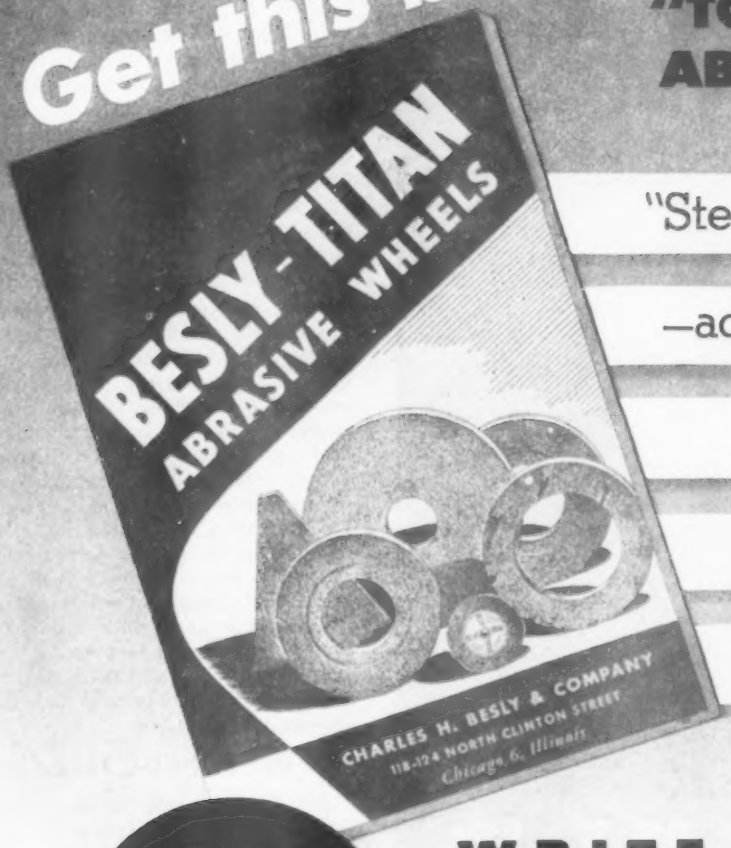

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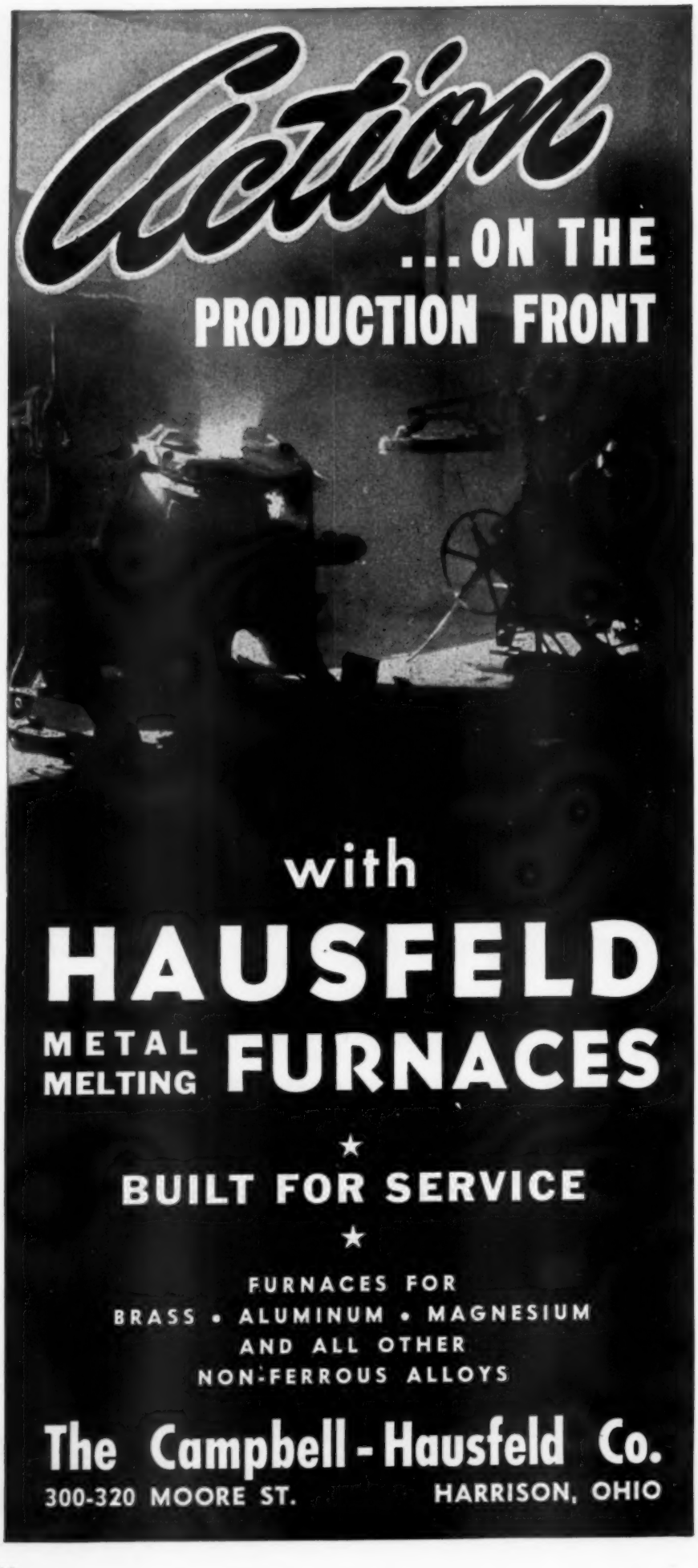


WISCONSIN FOUNDRY CONFERENCE

(*Continued from page* 128)

He said many foundries were having difficulty with manganese bronze, but that if consideration were given to a few factors, it could be overcome. For example, the ratio of copper to zinc controls tensile strength and elongation; as the copper increases, the tensile strength drops and elongation increases. Due to high zinc content gas seldom is found in manganese bronze. Pouring slowly avoids formation of dross. Moisture should be on the dry side. As manganese bronze is one of the high shrinkage alloys, sufficient gates and risers must be employed. Pouring temperature should not be any higher than necessary to prevent misrun castings.

Second session on nonferrous problems was devoted to job evaluation and costs. Frank Wartgow, American Steel Foundries, Chicago, was the discussion leader and stated that time and motion study of jobs would be of immense value in relieving the manpower situation as 15 minutes more production per man per day would improve conditions immeasurably. Job evaluation, he pointed out, gives the relationship of various jobs throughout the plant, and is the forerunner of time and motion study of the individual jobs. Good housekeeping enters indirectly into time study, since for best work it is necessary that the operator has his tools handy, and that he does not have to wade through several inches of sand.

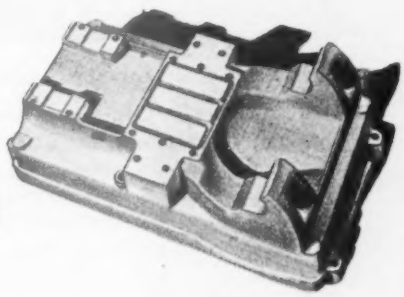
Remedy Working Conditions

Mr. Wartgow said the most important point is to put into operation the facts obtained in time study instead of following the old practice. Proper time study will remedy working conditions, eliminating heat and dust. Time study personnel should be selected carefully for best results. Members should have a reasonable education and be familiar with the operations. Administration of the program should be under the works manager, since it touches the whole plant, and he must receive full support of top management. Since the small shop cannot support a large personnel, it is advisable to employ basic or elemental standards for determining rates.

At the third nonferrous session Frank Chew, Federated Metals Division, American Smelting & Refining Co., Detroit, discussed various recommended procedures in aluminum foundry practice. He pointed out that high temperature melting and pouring should be avoided to prevent gas absorption and abnormal grain size. Experience will indicate the best temperature to use, but in any case below 1300 degrees Fahr. generally is preferred. Hard spots in aluminum castings, resulting from precipitation of primary constituents of the metal, frequently are

(*Continued on page* 166)

Magnesium alloys produce sound, easily machinable castings and Dow backs you up with quality materials and unmatched experience



If you're searching for casting alloys that will give you high strength, shock resistance . . . *plus light weight and good machinability* . . . then turn to magnesium.

Magnesium alloys can cut your costs by their thrifty, high-speed machining . . . easy sawing . . . fast drilling and tapping.

So turn to magnesium . . . and turn to Dow for Dowmetal Magnesium Alloys. These *quality* materials, produced to meet a wide variety of property requirements, have been developed over the years for their strength, toughness, machinability, corrosion resistance, thermal conductivity and adaptability to fabrication processes.

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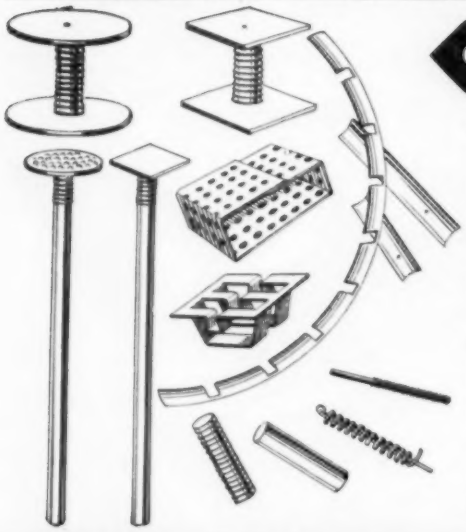

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For many years Milwaukee Chaplets and Chills have played an important part in producing better castings in less time, with fewer rejects. Their design and quality is being improved constantly to help the foundryman meet the demand for finer workmanship and higher production. Ask for samples and prices of Milwaukee Thread Stem Chaplets—Standard Radius Chills—Schmitz Chaplets — Patented Adjustable Radius Chills — Shells, Tubes and other types of Chaplets and Supplies.

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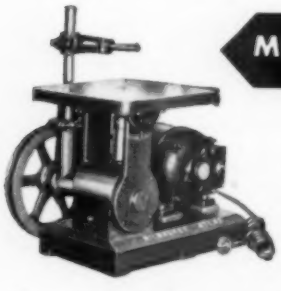

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A well designed, bench type machine of rugged construction for rapid and accurate trimming of intricate castings, and filing dies, jigs or fixtures. Eliminates many slow, costly hand filing operations.

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(*Continued from page* 164)

caused by addition of cold ingots to the furnace bath.

Nitrogen was recommended as the preferred agent for degassing, being introduced at the rate of 3 cubic feet per 100 pounds of metal over a period of 10 to 20 minutes. Porosity, which may be of the gas or shrinkage type, as well as grain size should be checked by macro etching. Both titanium and boron are useful as grain refiners.

Mr. Chew indicated that a large amount of secondary aluminum ingot will be available after the war, in view of the indicated presence of some 2 to 3 billion pounds of scrap at that time.

Opening session of the steel foundry group had David Zuege, Sivyer Steel Casting Co., Milwaukee, as chairman, with J. B. Caine, Sawbrook Steel Casting Co., Cincinnati, as its speaker on the subject of "Why Heat Treat?" Mr. Caine discussed the advantages of heat treating, including such factors as increased efficiency of alloy additions, improved physical properties in heavy sections and decreased notch sensitivity. He pointed out that when alloy castings are liquid quenched care must be taken in handling, and that to avoid cracks castings must be removed from the quench with the temperature at 500 to 600 degrees Fahr.

Favor Water Quenching

In the choice of quenches water quench is favored because it is cheapest and resulting physical properties are best. Air quench has the disadvantage of variable cooling rate throughout the load, whereas water quenching eliminates the effect of mass. Large car bottom annealing furnaces are not satisfactory for quenching, continuous ovens or good mechanical handling facilities being favored.

Future competition will force use of lower factors of safety in castings, thereby making alloying and heat treatment imperative, the speaker predicted. In turn, heat treatment makes control of all foundry operations more important and requires that analyses be held within very close limits. War requirements of steel castings, particularly armor plate, have demonstrated the value of heat treatment, but the process seems certain to find widespread application for peacetime products.

The succeeding steel foundry session was devoted to discussion of sand and mold handling, and included a paper on the subject by Harry C. Orr, the Bartlett & Snow Co., Cleveland. Mr. Orr emphasized that the intimate relationship between various foundry departments makes it necessary to consider the effects of changes in one department on the others. For example, addition of mold and sand handling equipment may necessitate use of continuous conveyor types of core ovens or may require speeding up or additions to facilities for handling and cleaning of castings or for melting.

Maintenance of sand and mold hand-

(*Continued on page* 168)

SIGNIFICANT SEALS

YOUR GUIDE TO CONSISTENTLY HIGH METALLURGICAL STANDARDS IN FERRO-ALLOYS

The Philo and Rainier brand seals of the Ohio Ferro-Alloys Corporation are particularly significant of the quality contained in their products. For these brands of ferro-alloys have advanced metal-melting practice in all types of plants—electric furnace, open hearth, bessemer, cupola. Constant research in our own production led to the patented metal-cast process for cleaner ferro-alloys.

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Ferro-alloys are supplied by the Ohio Ferro-Alloys Corporation in any tonnage to meet your requirements. Every ferro-alloy user is privileged to call on us for practical production-minded information on metallurgical problems. All inquiries receive a prompt reply. When required, and on your request, a competent Service Engineer will visit your plant for discussion and solution of ferro-alloy applications.

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—For internal or external grinding, burring and polishing. Made to fit any tool. Many styles, shapes and shank sizes.

Chicago Wheel takes pride in providing you with exactly the wheel you need, for exactly the job you have, to give you exactly the finish you want!

There's half a century of experience behind this, fifty years of specializing on grinding wheels—grinding wheels with hundreds of varieties in shape, size, abrasive and bond formulas, engineered for the right tool speed and work pressure.

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Send catalog. Interested in
☐ Mounted Wheels
☐ Grinding Wheels
☐ Send test wheel
Size _____

Name _____

Address _____

(*Continued from page* 166)

ling equipment can be a costly item and may materially affect the cost of the finished casting; it should be under the direction of a capable maintenance man who understands his job and who, especially, should have on hand adequate spare parts.

In considering installation of sand and mold handling equipment it is necessary that the design and arrangement of patterns, flasks and molding machines are such that they are suitable to mechanized operations.

Joseph A. Gitzen, Delta Oil Products Co., Milwaukee, presented an interesting discussion on cores and core binders at the third steel session. According to the speaker many binders and factors are involved in making good cores. Those include sand, binder, moisture and oven conditions. Two basic types of binders are available—organic and inorganic.

The organic binders include corn flour and proteins, paper mill byproducts, pitch compounds, resin binders, synthetic resin, linseed oil base binders and polymerized oil base binderss. Mr. Gitzen described these various binders, and indicated the advantage of each. He stated that oil-bonded cores must be baked completely in the oven since otherwise they result in dirty castings, veining and cracks. Time is required to oxidize core oil which usually does not occur until the moisture is driven off. While moisture is present, temperature of the core will not exceed 212 degrees Fahr. no matter what the oven temperature. Consequently, too much moisture should not be used as it costs money to drive it off. Preferred moisture range is 3 to 3½ per cent.

Provide Green Strength

Inorganic type binders include clay, bentonite, silica flour, iron oxide, and portland cement. Many of those are used to provide green strength. The combination of oil and inorganic binders can produce high strength at casting temperature. In conclusion Mr. Gitzen pointed out that physical properties of cores at room temperature are of little value, but the properties at pouring or casting temperatures are important.

At the final session on steel foundry problems Howard F. Taylor, Naval Research Laboratory, Washington, led the discussion on investment casting for maximum precision. Kenneth Geist, Allis-Chalmers Mfg. Co., Milwaukee, and Frank Vodoz, Cleaver-Brooks Co., participated. Mr. Taylor pointed out that the method is not new as Cellini used it in 1600, and it commonly is used in dental laboratories. However, its present rise to importance on a wide scale was due to demand for turbine buckets for airplane superchargers which had to be made in an unmachinable alloy, and hence made as closely to size as possible.

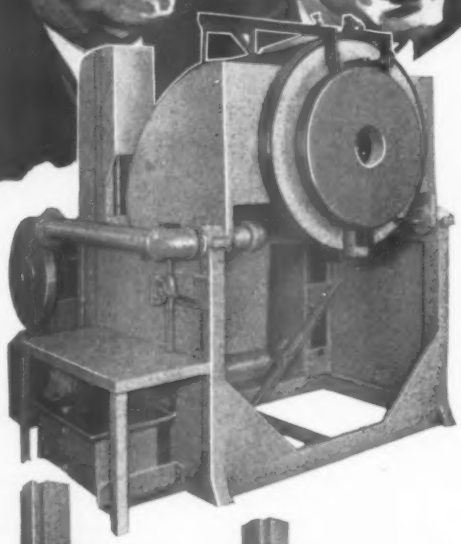
Investment or precision casting involves use of a semi-liquid refractory which is poured around a wax or plastic pattern. After vibrating to compact the material around the pattern, the mold is allowed

(*Concluded on page* 170)

. . . Is what many leading foundrymen say about the super-melting ability of Stroman Furnaces. No matter if they are melting Brass, Aluminum, Magnesium or any other non-ferrous metal, they have found that Stroman Furnaces, with their many exclusive features and advanced design, will do any given job of metal melting, better, faster and decidedly more economical.

Furnaces so highly approved by the industry are the ones you should consider before any additions or replacements of melting equipment are made in your foundry.

Send for Bulletin No. 75 wherein are reproduced many letters from prominent foundries stating facts and figures of Stroman Furnace's greater production ability . . . and remember . . . Stroman Engineers who are experts in foundry layout as well as metal melting are at your service for immediate consultation for either present needs or post-war planning.



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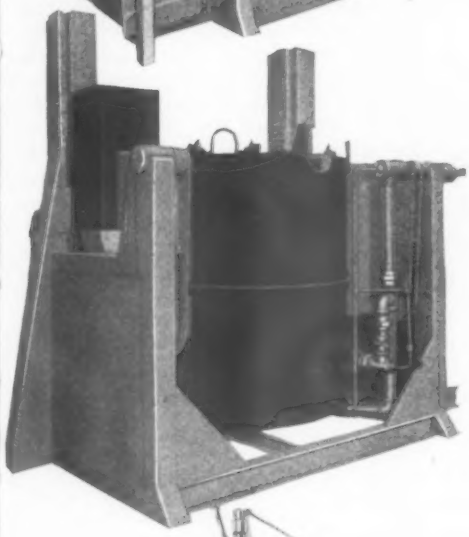
For Brass or Aluminum

Combines Stationary Lip Pour, Variable Speed Control, Push Back Cover, with Hydraulic Tilting to make these furnaces the most economical, speediest and safest to operate. Capacities from No. 150 to No. 400 Crucible.



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These furnaces also possess the many outstanding features of the Hydraulic Crucible Furnace shown above. Built to handle from 500 to 3,000 lbs. of Aluminum or 350 to 2,000 lbs. of Magnesium. Oil or Gas fire.

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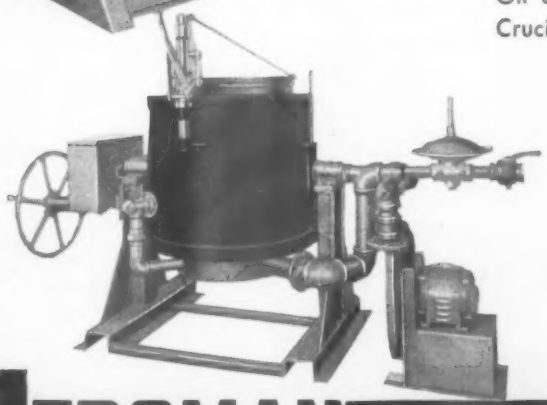
Oil or gas fire . . . Swing Cover . . . Capacities from No. 40 to 400 Crucible.



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MODEL 4000 — for wall type indicator or recorder. Has flexible arm adjustable to any angle without use of tools

For Instantly and Accurately Checking the Temperature of all Nonferrous Molten Metals

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All Elematic Thermocouples are equipped with our own, exclusive *Metalast Protection Tubes*—long life tubes which can be easily replaced without damaging or discarding the thermocouple, and at a saving of time and labor.

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ELEMATIC EQUIPMENT CORP.

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(*Concluded from Page* 168)

to set until the refractory solidifies. Then the mold is baked under high temperature and the pattern melts or volatilizes. Metal is poured into the mold centrifugally or under pressure. With this method castings are produced with an accuracy of 0.0001-inch in some cases. It is predicted that the investment casting method will have influence throughout the steel casting industry since closer finishes will be expected and attained.

Low melting point alloys are easiest to cast, and plaster of paris or gypsum cement has sufficient refractory properties for copper, gold, silver, brass, aluminum, etc. All ferrous alloys require special ceramic refractories. Mr. Geist briefly described work in investment casting being performed in his firm's plant. Mr. Vodoz emphasized the difficulties of investment casting. He said each phase of metallurgy, melting, refractory, etc. poses a major research problem. He believes the process will be confined to production of small castings, and that it does not belong in the foundry. He compared the relation of such casting to a foundry as similar to a tool room and a machine shop.

Because of the large number of technical sessions held during the Wisconsin foundry conference, it will be necessary to defer publication of the reports on some of the session until the April issue.

THE EDITORS

Pangborn Sets Up Employes' Trust

A profit-sharing trust has been approved by the United States Treasury and WPB for the benefit of employes of the Pangborn Corp., Hagerstown, Md. Employes who have completed 5 years continuous service with the company are eligible to participate without deduction from salary. Benefit payments are automatically started upon retirement, total disability, dismissal or termination of services with the corporation. The plan already has 287 participants.

3 HOUR LATHE JOB DONE IN 1 HOUR ON DoALL

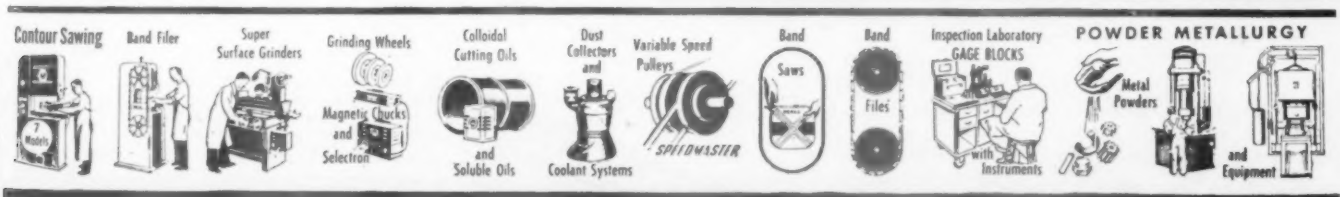
To bore 12" diam. holes in a 30" plate 1½" thick required only 1 hour each on the DoALL. A lathe could not swing the 30" plate, which had to be cut into two 15" plates and then it took 3 hours to bore each hole.

FASTEST METAL CUTTING METHOD TODAY

Whether it's armor plate, blocks a foot thick, tubing or stacked sheets, the DoALL goes right through them with no lost motion, time or energy. No other equipment or machine can compare with the DoALL for straight line and contour work, internal and external sawing of metals, alloys, plastics, laminates and wood.

6 models to select from—a size for every need—priced from $1,000 to $5,000 with motors.

Send for an interesting story-in-pictures of DoALL ADVANTAGES over 9 Basic Cutting Methods



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THE CRUCIBLE FURNACE

Most Widely Adaptable Melting Unit

Navy ingenuity sets up crucible furnace in the field Used for salvaging brass and copper. Official U. S. Navy photographs

IN every Non-Ferrous foundry, large or small, whether equipped with the most modern furnaces or a "Jury Rig" outfit (see illustration) Crucible melting pays best.

It pays best in low investment required, in low melting loss, in saving in capital required, in low stand-by charges, in adaptability to many usual and unusual installations, and in flexibility to meet your coming varying tonnage requirements.

Year after year, your foundry will profit best when you standardize on Crucibles for all your non-ferrous melting. To see what others are doing with Crucible melting, write for the "Crucible Melters' Handbook." Sent on request.

CRUCIBLE MANUFACTURERS ASSOCIATION

90 WEST STREET, NEW YORK 6, NEW YORK

A.F.A. Officers and Directors Nominated

(*Continued from page* 130)

1921 he established the Cadillac Malleable Iron Co., where he became secretary and general manager, and later assumed the presidency. Mr. Teetor was vice president of A. F. A. in 1943-44 and was elected president last year.

George K. Dreher

GEORGE K. DREHER, director and former president of the Wisconsin Chapter, A. F. A., has been associated with Ampco Metal Inc., Milwaukee, since 1930. He served as foreman in 1932-33, successively becoming supervisor, superintendent, and plant manager. In 1941 he was appointed works manager, and later was made vice president in charge of manufacturing. Mr. Dreher was born in Calumet, Mich., and attended Lawrence College, Appleton, Wis.

Edwin W. Horlebein

EDWIN W. HORLEBEIN has served two terms as president of the Chesapeake Chapter, A. F. A., and currently is a director. Born in Baltimore, Mr. Horlebein was with the Baltimore & Ohio Railroad from 1915 to 1918 as a machine apprentice. Following service as a lieutenant in the field artillery during World War I he joined the engineering department of the Dixie Mfg. Co., Baltimore, and in 1924 went with the Gibson & Kirk Co., Baltimore, of which he now is president.

Harold H. Judson

HAROLD H. JUDSON, first chairman of the Central New York Chapter, A. F. A., was graduated from Worcester Polytechnic Institute in 1923, with a degree in mechanical engineering. During the following 3 years he was foundry engineer with Riley Stoker Co., Detroit, and in 1926 he became connected with Goulds Pumps Inc., Seneca Falls, N. Y., as foundry superintendent. In 1936 Mr. Judson was author of the A. F. A. exchange paper presented at the annual meeting of the Institute of British Foundrymen.

James H. Smith

JAMES H. SMITH was born in Jackson, Mich., and joined the Buick Motor Division, General Motors Corp., Flint, Mich., in 1915. He remained there until 1919, except for a year's service in the Army Signal Corps, when he went with Saginaw Products Co., Saginaw, Mich. In 1930 Mr. Smith transferred to the Saginaw Malleable Iron Division, General Motors Corp. He was appointed works manager of that plant in 1938 and general manager in 1941.

F. M. Wittlinger

F. M. WITTLINGER played a prominent part in establishment in 1943 of the Texas Chapter, A.F.A., and at present is chairman of that group. Mr. Wittlinger is secretary and general manager of the Texas Electric Steel Casting Co., Houston, Tex., with which he has been associated since

(*Concluded on page* 174)

Now Available

TO EVERY FOUNDRY

MAINTAINS PERMEABILITY

INCREASES PERMEABILITY

MINCO BOND

ATTENTION PRODUCTION FOUNDRIES OF AMERICA

The introduction of MINCO BOND into the sand systems of the Production Foundries of America is the greatest advance in Production Foundry practice since the introduction of Western Bentonite years ago.

By replacing with MINCO BOND, one half the quantity of Western Bentonite customarily used, the same *Green Strength* is maintained, and *high flowability* and *high collapsibility* are acquired.

MINCO BOND has little or no expansion and contraction and when added to a Western Bentonite system, it controls or stops the contraction of Western Bentonite in the mold, leaving a perfect mold surface, free of cracks and fissures, with corners and edges of mold, firm and strong and which will not crumble and break off.

MINCO BOND when used thus, as a diffusion agent with Western Bentonite in production systems, *adds high flowability* and reduces shake out and cleaning costs sometimes as much as 50%, with still smoother castings.

MINCO BOND is almost a neutral mineral having a pH of approximately 7.5 and in every instance where used in production foundries with Western Bentonite, it has reduced scrap losses due to sand failure as much as 50%.

MINCO BOND can be used as the sole bonding agent in floor shops or heap system foundries. It can be cut into heaps with a spade or cutting machine and with shake out and reconditioning characteristics better than natural molding sand.

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BUILT FOR CAPACITIES TO 1800 C.F.M. PRESSURES TO 125 LB. VACUUMS TO 29.90 IN. REFERRED TO 30 IN. BAROMETER
AND VACUUM PUMPS
"SPOT" YOUR COMPRESSORS
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Why — compress air to 100-lb. when lower pressures will do the work?

There is no necessity to continue the old practice of compressing air at a central point with large-size, high-pressure units working on pressures equal to the highest demands from any part of the plant. It is costly to compress air to a hundred pounds or higher, and then reduce it to from 10 to 50 pounds for any one particular use.

You can eliminate this costly practice by the installation of Fuller Rotary Compressors. *"Spot your compressors where you need the air."*

Single-stage compressor shown above is one of 14 installed in a single plant, each "spotted" as close as possible to the point of utilization of the air.

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No. 2 of a series C-110

FULLER
PIONEERS OF HIGH-EFFICIENCY ROTARY COMPRESSORS

(*Concluded from page* 172)

1927. He was born in Middletown, O., and for a number of years was with foundries in Ohio and Indiana, including the U. S. Cast Iron Pipe Co., Addyston, O.; Mal-Gra Casting Co., Cambridge City, Ind.; American Rolling Mill Co., Middletown, O., and Midwest Casting Co., Middletown. Mr. Wittlinger was general manager at Midwest Casting Co. from 1919 until transferring to Texas.

Activities of Foundry Groupes

(*Continued from page* 148)

castings and leakers which Mr. O'Connor examined and analyzed the causes for such defects.

The meeting was also called "Ajax Night," and there were 150 members and guests present to greet Dr. Clamer and his associates.—*B. A. Miller.*

Wisconsin

MEETING of the Wisconsin Chapter of the A.F.A., held at the Schroeder Hotel, Milwaukee, Jan. 12, offered a double-header program. After the dinner, short talks were given by national officers of the American Foundrymen's Association, who were guests of honor. Sectional discussions by six different groups followed.

"Melting Practice" was discussed by Walter Jaeschke, Whiting Corp., before the Gray Iron section, of which William Brooks, Allis Chalmers Mfg. Co., was chairman, and Martin Chambers, Nash-Kelvinator Co., co-chairman. Installation of cupolas, automatic air weight control, moisture control, hot blast, use of coke, charging, cupola daub, bottom, and flux, were among the important points touched upon.

The Pattern section meeting was devoted to discussion of the materials which are best for wood or metal patterns and flask equipment construction. Chairman A. F. Pfeiffer, Allis Chalmers Mfg. Co., conducted the meeting. Discussion leaders were A. W. Thompson, Lakey Foundry Machine Co., Mr. Peterson, Tegge Lumber Co., and Henry C. Frey, Patek Bros, Inc. Mr. Peterson passed samples of various lumbers among the group, and described the advantages of pine, mahogany, and cherry for patterns, when they are available for use. He discussed moisture content of kiln-dried lumber, recommending Norway pine for wood flasks. Mr. Frey, in his discussion of liquids, discussed the use of shellac, lacquer, sugar or salt as fire repellants and the effect of grease or oil on coatings. Mr. Thompson gave a brief talk on metal materials used for patterns, mentioning cast iron, brass and aluminum with cast iron preferable.

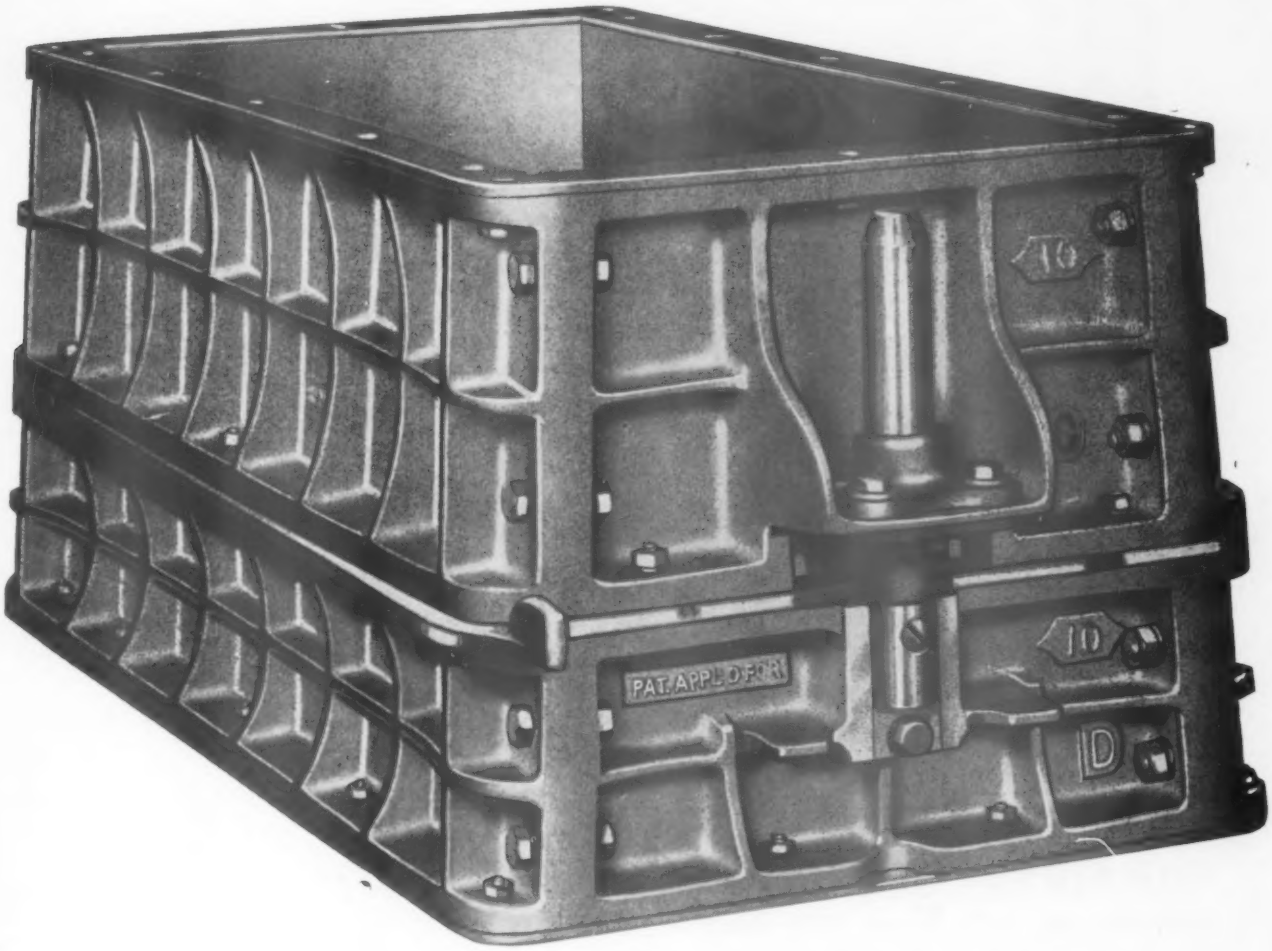
"The Sandslinger in the Steel Foundry" was the subject of the Steel group, discussed by H. C. Schlichter, Beardsley & Piper Co. Charles Stull, Pelton Steel Castings Co., was chairman, assisted by Norman Koch, Grede Foundries Inc.,

(*Concluded on page* 176)

Fremont Flasks again available in

MAGNESIUM METAL

PROMPT ATTENTION GIVEN ALL ORDERS



FREMONT FLASKS have established a reputation for efficiency and long wear and in most progressive foundries have replaced the old type, cumbersome. heavy weight equipment.

The FREMONT FLASK with the 1" GROOVLOCK PIN is especially adapted to snap work but can also be furnished with cast ears to accommodate other pins.

Slip Flasks **FREMONT** Jackets

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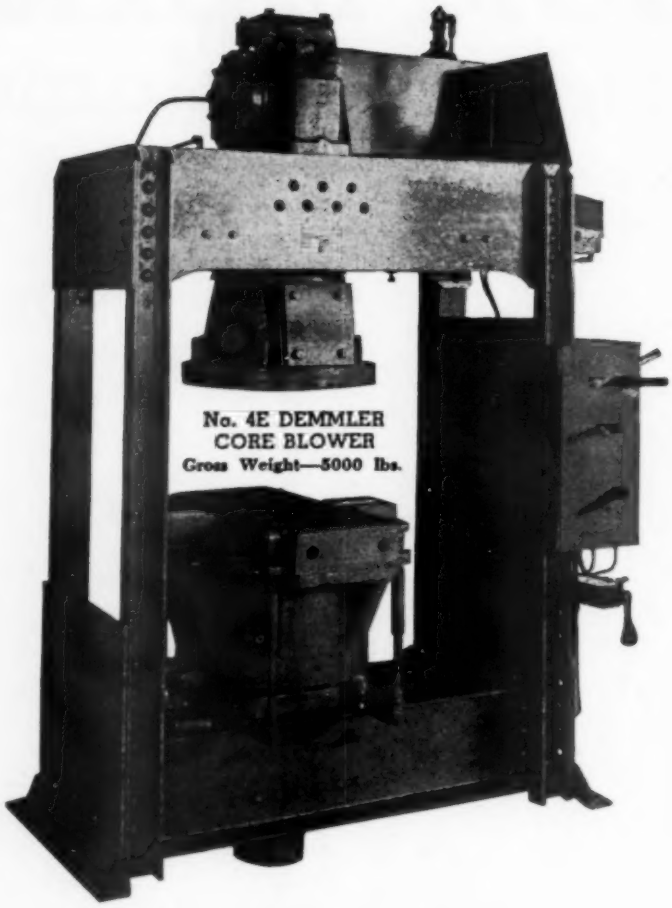


NEW HEAVY-DUTY BLOWER
FOR MOTOR CASTINGS WORK . . .
Strictly for BIG Cores and Fast Production
Takes Core Box up to 18" x 24"

Designed as a special blower for a leading producer of airplane motor castings, this unit is now offered as a standard Demmler blower. Features include an accurate hydraulic core box draw, table equipped with Timken rollers, 12" diameter throat opening, control mechanism totally enclosed. The height of the frame may be adapted to varying sizes of core boxes.

Reports on this new machine from users indicate that it has unusual possibilities in production of aircraft, tank and truck motor castings. At the present time we can make good deliveries, and invite your inquiries.

WM. DEMMLER & BROS. · KEWANEE, ILLINOIS

CORE BLOWERS *Exclusively*

(*Concluded from page* 174)

Chairman of the Malleable group was Joe Kropka, Chain Belt Co. "Uses of Electronic Devices in the Foundry" was discussed by P. E. Cavanagh, chief metallurgist, Allen B. DuMont Laboratories.

Chairman Carl Van Buren, Allis Chalmers Mfg. Co., conducted the Nonferrous group. Edward Jagmin, production manager, Ampco Metal Inc., discussed "Production Control."

The Technical group session on "Methods of Chemical Analysis" had Parry Peld, Sivyer Steel Casting Co., and Robert J. Cox, Ampco Metal Inc., as speakers. Chairman was L. E. Royt, Allis-Chalmers Mfg. Co.—*Walter Gerlinger, publicity chairman.*

Pittsburgh

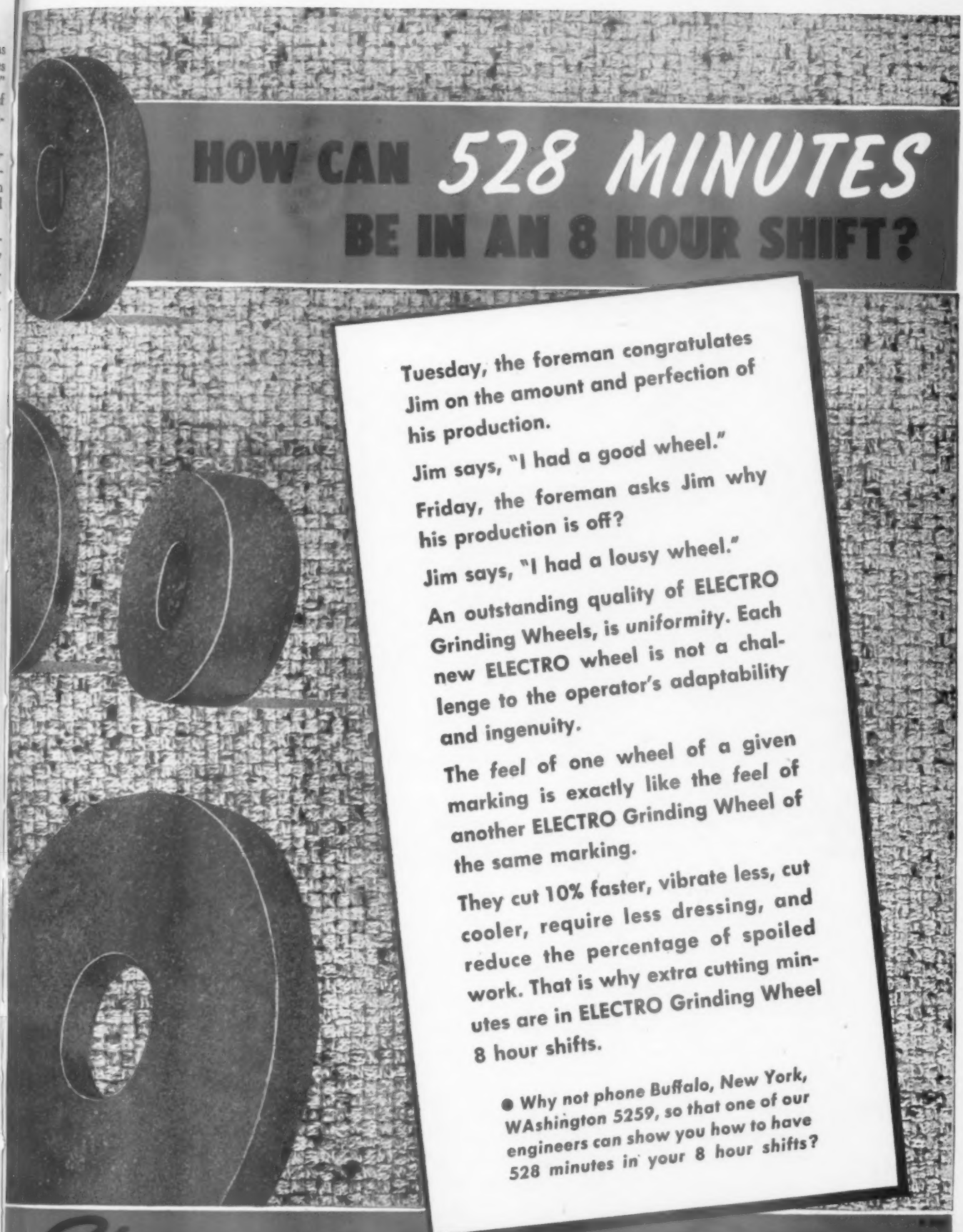
EXPANDED physical properties of cast iron have resulted in an expanded potential market for castings, according to J. S. Vanick, International Nickel Co., New York, speaking before the Pittsburgh Foundrymen's Association at the January technical meeting.

New horizons have been established for cast iron by reason of new developments in tensile strength, in heat treating technique, in resistance to heat, in machinability and in structure control and wear resistance, Mr. Vanick stated. High strength irons which now can be produced by practically any foundry are applicable in many instances where only steel castings or forgings could be used previously.

Better control of carbon, through application of malleable iron methods to the gray iron foundry practice, will result in better physical properties. Great improvement in physical properties of castings can be obtained through proper utilization of heat treating technology already developed and applied to other ferrous products. Better control over the microstructure of the iron pays big dividends in the physical properties of the finished casting. Graphite control, secured primarily to close control of the iron during the melting process, is vital to uniformly good physical properties.

Some progress has been made in producing irons which hold their strength at temperatures ranging as high as 1600 degrees Fahr. Results comparable to those obtained with high alloy stainless steels have been obtained on cast iron using the nickel - chromium - silicon - aluminum compounds. Cast iron pressure vessels meeting AIME specifications have been successfully produced for high temperature, high pressure applications.

John S. Alwine, director of apprentice training, War Manpower Commission area office, Pittsburgh, urged foundrymen to use the facilities of his office for the training of new foundry workers, particularly returning war veterans. Pointing out that under the GI bill of rights these returning men will be guaranteed a trade, Mr. Alwine indicated they might take an important part in both current and postwar plans of the foundry industry—*R. L. Hartford.*



HOW CAN 528 MINUTES BE IN AN 8 HOUR SHIFT?

Tuesday, the foreman congratulates Jim on the amount and perfection of his production.

Jim says, "I had a good wheel."

Friday, the foreman asks Jim why his production is off?

Jim says, "I had a lousy wheel."

An outstanding quality of ELECTRO Grinding Wheels, is uniformity. Each new ELECTRO wheel is not a challenge to the operator's adaptability and ingenuity.

The feel of one wheel of a given marking is exactly like the feel of another ELECTRO Grinding Wheel of the same marking.

They cut 10% faster, vibrate less, cut cooler, require less dressing, and reduce the percentage of spoiled work. That is why extra cutting minutes are in ELECTRO Grinding Wheel 8 hour shifts.

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THAT MEETS EVERY TEST...
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Officially Approved by the U. S. Bureau of Mines

Safety is the first consideration in foundry shot-and-sandblast protective equipment—comfort is a vital runner-up! Both demands are fully realized in the popular M.S.A. Abrasive Mask—tested and approved for protective efficiency, light in weight and easy to wear throughout the working period. Consisting of a durable hood which cushions the impact of abrasives, snug-fitting facepiece and connecting tube, flow control valve with "bump-proof" adjustment, quick release connection and optional air filter, web belt, and air hose with couplings, the M.S.A. Abrasive Mask is designed in every particular for heavy-duty service.

Write for complete details in Bulletin CS-18!

MINE SAFETY APPLIANCES COMPANY
BRADDOCK, THOMAS AND MEADE STREETS
PITTSBURGH 8, PA.

Men of Industry

(*Continued from page* 112)

ties Mr. Higgins will continue as treasurer. **Ralph M. Johnson,** general sales manager of the abrasive division, and **Frank W. Smith** also have been named vice presidents. Mr. Smith has also been appointed manager of the grinding machine division, succeeding **Howard W. Dunbar,** vice president, who will continue to serve the company in an executive capacity. Other new appointments in the grinding machine division include **Albert G. Belden,** manager of research and engineering, **Iver G. Freeman,** factory manager, **Roger Magoun,** production manager, and **C. Denson Day,** sales manager.

♦ ♦ ♦

Robert J. Quinn, assistant to the vice president-director of sales, Mathieson Alkali Works Inc., New York, has been elected president of the Compressed Gas Manufacturers' Association Inc., New York. **Clarence M. Pitts,** president, People's Gas Supply Co. of Ottawa, has been elected first vice president of the association, and **C. G. Andrew,** director of engineering and gas plants of Air Reduction Co., New York, second vice president. **Major F. R. Fetherston** of the U. S. Army continues as secretary-on-leave, and **Florence Jacob** has been re-elected acting secretary and treasurer.

♦ ♦ ♦

Sparrow E. Purdy has retired as president of Hyman-Michaels Co., Chicago, and has announced the formation of the Purdy Co., with offices at 122 South Michigan avenue, Chicago. The new company will engage in the railway equipment, allied enterprises, and general scrap business. **J. P. Purdy, John I. Duffy,** and **M. H. Barnes,** who were also formerly with Hyman-Michaels Co., will be associated with Mr. Purdy.

♦ ♦ ♦

LeRoy A. Petersen, recently executive vice president, Otis Elevator Co., New York, has been elected president, succeeding the late Jesse H. Van Alstyne. Mr. Petersen has been associated with the company since 1921. **Edward A. Fitch,** since 1925 vice president in charge of manufacturing, has been elected to the board. Mr. Fitch entered the Yonkers, N. Y. works in 1899.

♦ ♦ ♦

Ralph B. McKinney, general manager of the paper makers chemical department, and **Dr. Wyly M. Billing,** general manager of the synthetics department, have been elected to the board of directors of Hercules Powder Co., Wilmington, Del., succeeding **Charles C. Hoopes** and **George M. Norman,** who have retired after 32 years of service with the company.

♦ ♦ ♦

Dr. C. G. Suits has been elected vice president and director of the research laboratory of General Electric Co., Schenectady, N. Y., succeeding **Dr. W. D. Coolidge,** who has retired. Dr. Suits

had been assistant to the director since 1940.

♦ ♦ ♦

John G. Davison, Denver, has been appointed Colorado representative of Wheelco Instruments Co., Chicago. **Olin Phillips,** Toledo, has been named to represent the company in the northern Ohio territory. The state of Minnesota has been added to the territory served by **L. E. Crytmus,** Milwaukee.

♦ ♦ ♦

Charles S. Herbert, Enterprise Engine & Foundry Co., San Francisco, **Charles R. Tuckerman,** Oberdorfer Foundries Inc., Syracuse, N. Y., and **Milo F. Snyder,** Ampco Metal Inc., Milwaukee, have been elected to membership in the Controllers Institute of America, a technical and professional organization devoted to improvement of controllership procedure.

♦ ♦ ♦

Dr. Martin de Simo, director of research and development, Great Lakes Carbon Corp., Chicago, has been elected vice president in charge of research and development. He has been associated with the company since 1941.

♦ ♦ ♦

Stanley D. Whiteside has been appointed district engineer in the Michigan area for W. S. Rockwell Co., New York, with headquarters in Detroit. Mr. Whiteside has served for a number of years as an applications, design and service engineer on furnaces for the company.

♦ ♦ ♦

H. E. Preston has been elected vice president in charge of engineering, American Engineering Co., Philadelphia.

Officers Elected by Steel Founders

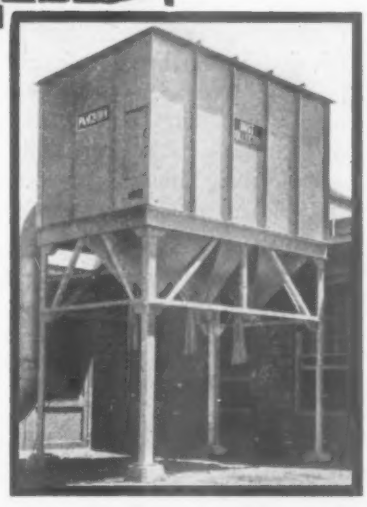
A. M. Andorn, secretary and treasurer, Penn Steel Castings Co., Chester, Pa., was elected president of the Steel Founders' Society of America, at a meeting of the board of directors held Jan. 10. He succeeds Oliver E. Mount, American Steel Foundries, Chicago. Other officers elected include: Vice president, A. A. Stroppel, vice president and general manager, Sawbrook Steel Casting Co., Lockland, O.; executive vice president, Col. Merrill G. Baker; executive secretary and assistant treasurer, R. L. Collier; treasurer, Harrison Hoblitzelle.

Members of the executive committee are: A. M. Andorn, A. A. Stroppel, and E. D. Flintermann, Michigan Steel Casting Co., Detroit.

Named to the board of directors are: A A. Stroppel; E. D. Flintermann; Newlin T. Booth, Deemer Steel Casting Co., New Castle, Del.; C. P. Champlin, Strong Steel Foundry Co., Buffalo; J. S. Wardle, Mobile Pulley & Machine Works, Mobile, Ala.; J. M. Lloyd, American Steel Foundries, Verona, Pa.; C. A. Binder, St. Louis Steel Casting Co., St. Louis, and E. C. Hummel, Utility Electric Steel Foundry, Los Angeles

"PAY DIRT"

DUST IS THE "PAY DIRT" OF INDUSTRY—CONTROLLED, it pays large dividends; unchecked, it becomes a great destroyer. Whether it is the recovery of valuable dust or if it is the checking of its destructive action, DUST, when it is controlled, will save the manufacturer many times the cost of installing and operating an efficient dust collector.



SCATTERED THROUGHOUT THE WORLD, THOUSANDS OF **PANGBORN DUST COLLECTORS** stand as conclusive proof that **DUST CONTROL** is an economic necessity to all modern industrial plants.

Write to us, we'll be glad to advise you on your particular dust problem—there is no obligation.

PANGBORN

WORLD'S LARGEST MANUFACTURER OF DUST COLLECTING AND BLAST CLEANING EQUIPMENT

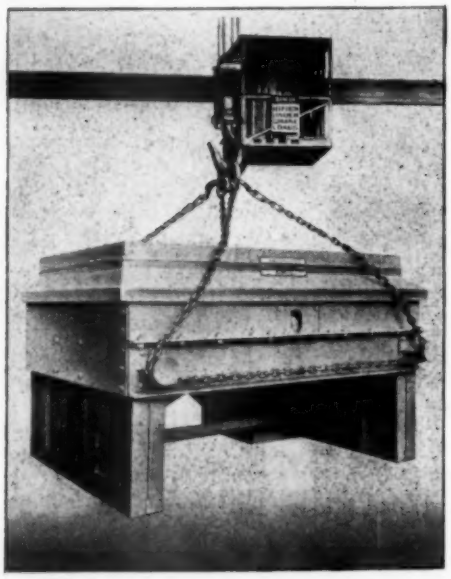
PANGBORN CORPORATION · HAGERSTOWN, MD.

Speaking of Shakeouts

WHAT ABOUT VIBRATION?

THIS MATTER OF VIBRATION in Shakeouts is important; it affects your costs in several ways. First, there is the cost of installation. The size and depth of the foundation you must build depend on the amount of vibration transmitted from the Shakeout into its base.

The Robins Floatex is genuinely full-floating; heavy, soft coil springs carry and cushion the entire frame and its superimposed load. The Floatex shakes the flask—not the building. So foundation costs are appreciably smaller. In fact, no foundation at all is needed for the Portable models—just put them anywhere on the foundry floor.



Next there is the matter of flask-damage; because of its gentle action, the Floatex is kind to flasks. Savings on this item alone have been estimated as high as $1500 a year in some plants. Then there is the subject of rejects; the Floatex does not harm even delicate bronze, aluminum or magnesium castings.

Finally, we come to maintenance. Here the Floatex has set records that have been called truly amazing. In the entire unit, there are only two bearings—and they do not carry any part of the load. There are no rigid shafts or outboard bearings to be harmed by overloads. There is nothing about the Floatex that is weak, fragile or vulnerable.

Viewed from any angle—installation, operation, maintenance, repairs—vibration is no problem to the foundry owning a Floatex Shakeout. Interesting facts and figures are yours to examine without cost or obligation. When asking for them, please address Dept. F3.

Robins Floatex Shakeouts are made in Portable models for loaded flasks weighing up to 17 tons; in Standard models, up to 100 tons or more—non-discharging and self-discharging types. Completely described in Bulletin 124-F3.

ROBINS *makes:* BELT CONVEYORS • COAL AND ORE BRIDGES • BUCKET ELEVATORS • CAR AND BARGE HAULS • CAR DUMPERS • CAR RETARDERS • CASTINGS • CHUTES • CONVEYOR IDLERS AND PULLEYS • CRUSHERS • FEEDERS • FOUNDRY SHAKEOUTS • GATES • GEARS • GRAB BUCKETS • PIVOTED BUCKET CONVEYORS • VIBRATING SCREENS • SCREEN CLOTH • SELF-UNLOADING BOAT MECHANISMS • SKIP HOISTS • STORAGE AND RECLAIMING MACHINES AND SYSTEMS • TAKEUPS • LOADING AND UNLOADING TOWERS • TRIPPERS • WEIGH LARRIES • WINCHES • WINDLASSES

FOR MATERIAL AID IN MATERIALS HANDLING . . . . . It's **ROBINS**

ENGINEERS • MANUFACTURERS • ERECTORS

ROBINS CONVEYORS INCORPORATED
Founded in 1905 as Robins Conveying Belt Co.
PASSAIC • NEW JERSEY

MATERIALS HANDLING MACHINERY

OBITUARY

DENIS F. O'Brien, 80, board chairman and former president, A. P. Smith Mfg. Co., East Orange, N. J., died Jan. 31 at his home in that city. He became associated with the company at the time of its incorporation in 1898. Mr. O'Brien held patents on water valves and fire hydrants which constitute the company's principal products. He became president in 1910 and held that position until 1941, when he retired in favor of his son, Hubert F. O'Brien. Born in Ireland, he was educated at Dublin University, and came to this country in 1882, subsequently becoming associated with the Michigan Brass & Iron Works, Detroit.

• • •

Thompson W. Kirby, 65, president, A. T. Wagner Co., Detroit, died Jan. 7 in that city. A native of Guelph Township, Wellington County, Ontario, Canada, he was associated with Canadian Stove Mfg. Association, Gurney Tilden Co., Hamilton, and Kir-Ben Ltd. Co., Almont, until 1907, when he became assistant manager of the Cleveland branch of Osborn Mfg. Co. In 1925 Mr. Kirby was appointed sales manager of A. T. Wagner Co., and became president after Mr. Wagner's death. He was a member of the advisory committee, Electro-Plating Industries, WPB, Washington.

• • •

George J. Weber, 59, engineer of tests, Association of Manufacturers of Chilled Car Wheels, Chicago, died suddenly in that city, Jan. 20. Mr. Weber had been affiliated with the car wheel industry since 1905. He left Griffin Wheel Co., Chicago, in 1934 to become secretary of the association, subsequently became executive secretary to the president, and in 1942 assumed the post of engineer of tests.

• • •

Fred W. Grant, merchandising engineer, Norton Co., Worcester, Mass., died Jan. 25 in that city. Mr. Grant had been associated with Norton Co. for 32 years and was appointed merchandising engineer in August, 1944. For the previous 19 years he had been abrasive engineer in the Milwaukee territory.

• • •

Morgan T. Williams, 70, managing director, Bond Foundry & Machine Co., Manheim, Pa., for 39 years, died Jan. 2 in that city. Mr. Williams was vice president, Bond Engineering Works Ltd., Toronto.

• • •

Andrew F. Schubert, 58, for the past 25 years superintendent of Bovaird & Seyfang Co., now a division of Dresser Industries Inc., Cleveland, died recently in Bradford, Pa.

• • •

John Eckerle, 75, chairman, Aluminum Industries Inc., Cincinnati, died Jan. 24 in Miami Beach, Fla. In 1920 Mr. Eckerle and a son-in-law, Harry J. Hater, bought the Kant-Skore Piston Co.

(*Concluded on page* 182)

NORTON DISC WHEELS . . .

RESINOID BONDED for Fast Grinding in the Cleaning Room

Surface grinding with Norton Resinoid Discs is the quickest and easiest way to do many snagging jobs. These discs not only remove metal quickly but leave a surface that often needs little or no further machining.

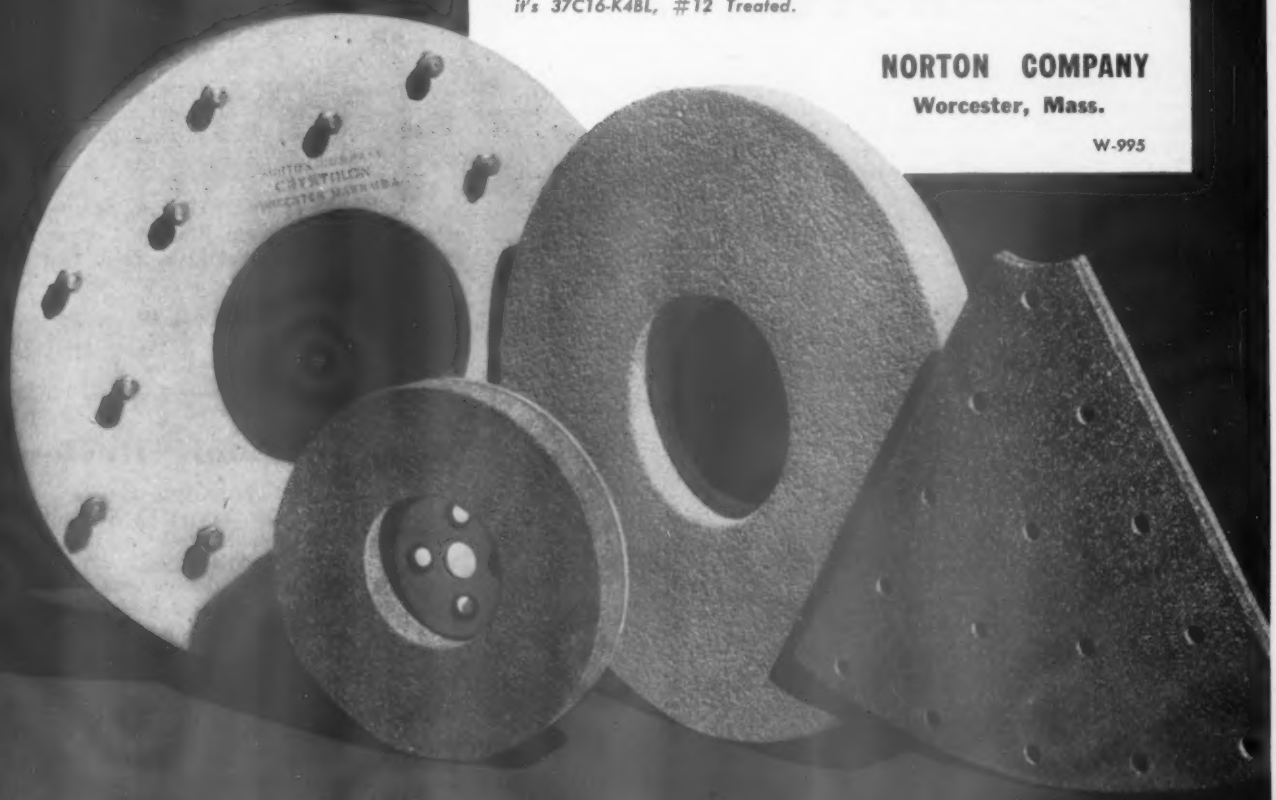
Norton Resinoid Discs are available in all the sizes and types of mountings necessary for foundry grinding—for both vertical spindle and horizontal spindle machines—in Alundum abrasive for steel and malleable iron castings—in Crystolon abrasive for gray iron, brass, bronze and aluminum castings.

Suggested Specifications

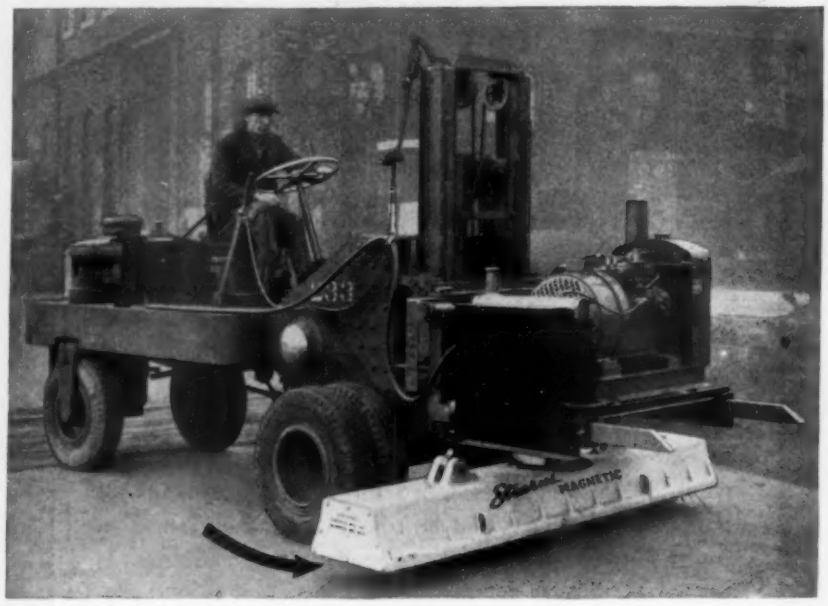
A16-L4BL is a popular specification for Norton Resinoid Discs for steel castings. A16-L4BL "special" is particularly effective on malleable iron because of its abrasive combination. For cast iron the popular resinoid disc specification is 37C16-K4BL and for brass, bronze and aluminum it's 37C16-K4BL, #12 Treated.

NORTON COMPANY
Worcester, Mass.

W-995



NORTON ABRASIVES



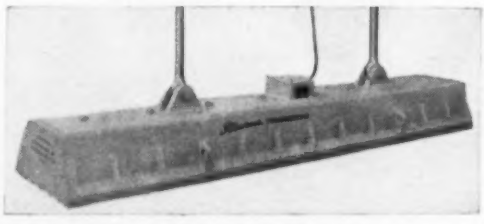
Stearns Road Sweeping MAGNETS

Tire conservation means keeping roadways clear of tramp iron and metallic refuse. Large industrial operations of all kinds are using Stearns Road Magnets with surprisingly profitable results.

And—the value of the scrap metal thus recovered has paid for many of these magnets. Also—they can be detached and used as lifting magnets for handling sheet and other steel, moving material and similar jobs.

Magnets like these are only part of the extensive line of magnetic separators, pulleys, drums, suspended separation and lifting magnets that Stearns Magnetic offers for protection, reclamation, purification, concentration and separation purposes.

Let us help you in production problems, lower your costs, with Stearns Magnetic equipment. Make use of our extensive engineering and laboratory facilities. Consult Magnetic Headquarters.



RECTANGULAR AND CIRCULAR LIFTING OR SUSPENDED MAGNETS

Stearns

SEPARATORS DRUMS
ROLLS CLUTCHES
BRAKES PULLEYS

MAGNETIC MFG. CO.

662 S. 28th St. Milwaukee 4, Wis.

(*Concluded from page* 180)

and moved manufacturing operations from Buffalo to Cincinnati, later changing the firm name to Aluminum Industries Inc. He was president of the company until last July.

• • •

Eshelby F. Lunken, 54, president, the Lunkenheimer Co., Cincinnati, died Jan. 25, in that city. Mr. Lunken had been connected with the Lunkenheimer Co. for 35 years, having served as president 26 years. His father, Edmund H. Lunken, who was chairman of the company's board of directors, died last July. His grandfather, Frederick Lunkenheimer, was founder of the company.

• • •

Roy C. Willey, abrasive engineer, Norton Co., Worcester, Mass., in the Pittsburgh territory, died Jan. 16 at Pittsburgh. Mr. Willey, who had been with Norton Co. for 23 years, was office manager in Pittsburgh for 17 years and was appointed abrasive engineer in October, 1944.

• • •

Louis Paltenghi, 83, for the past 36 years office manager for H. C. Macaulay Foundry Co., Berkeley, Calif., died there Dec. 14.

• • •

Walter E. Carolin, 55, for 40 years associated with the management of the Enterprise Foundry Co., Detroit, died Feb. 4 in that city.

• • •

Arthur J. Morse, founder and president of Alloy Steel & Metals Co., Los Angeles, died Jan. 17 in San Juan Capistrano, Calif.

• • •

Horton L. Howard, 43, superintendent, Howard Brass & Copper Co., Milwaukee, died Dec. 23 in that city.

• • •

David M. Boal, 64, president of Boal Foundry & Machine Works, Fort Smith, Ark., died there Dec. 10.

Book Review

The Industrial Supervisor, by John M. Amiss and Traver C. Sutton; published by the Ronald Press Co., 15 East Twenty-sixth street, New York. Price $3.

This is a training guide for improvement of skill and leadership and is intended for all supervisors, experienced and inexperienced, who desire to improve their judgment, skill and understanding of their work, and thus develop their powers of leadership. It is especially prepared to meet needs of men in smaller shops not having advantages of an organized industrial training department, who are at a loss to know where to obtain the supervisory training now recognized as a necessity.

It is intended for use by individuals who want to improve ability by home study and also for small groups who seek to improve themselves by conference discussions. Material is practical and has been used in conferences of large numbers of supervisors in small groups.

Better to start with . . .

ALCOA ALUMINUM pig and ingot are uniform, sound, fine of grain, and remarkably free of inclusions—the result of 57 years of manufacturing experience.

Alcoa offers you, in addition, the consulting services of highly skilled aluminum technicians, to help you with your metallurgical problems. ALUMINUM COMPANY OF AMERICA, 1823 Gulf Building, Pittsburgh 19, Pa.

ALCOA FIRST IN ALUMINUM

ALCOA ALUMINUM

Buell's assurance of...

HIGH EFFICIENCY LOW MAINTENANCE LONG LIFE

BELIEVING that progressive plant executives and engineers will welcome detailed information pointing up the reasons for industry's growing preference for Buell's advanced design in high-efficiency dust collecting systems, Buell will inaugurate a series of six explanatory advertisements descriptive of the engineering factors largely responsible for Buell's constantly increasing installations.

Look for these enlightening dust recovery messages in leading industrial and engineering publications. They will technically detail the advantages of the six outstanding Buell features briefed below.

1. *The "Shave-Off"* . . . The patented van Tongeren principle, exclusive with Buell. Utilizes the "double eddy" current, establishing a highly efficient collection force.

2. *Large Diameters* . . . Permit use of extra thick metal. Afford large dust outlets, prevent clogging. Reduce abrasion.

3. *Extra-Sturdy Construction* . . . Rolled and welded, one piece construction; hoppers braced with 3" channels to withstand vibration.

4. *Correct Hopper Design* . . . Plays a most important, often disregarded, part in dust collection efficiency. Dust disposal facility must be anticipated in the initial overall design.

5. *Split-Duct Manifolding* . . . A prime factor in efficient distribution of the dust load. Buell's manifolding method has flexibility, discharging gases from any side or end.

6. *Inner Welds Ground Smooth* . . . Proper finishing of inner welds effects operating efficiency, reduces erosion, ensures longer life.

buell
DUST RECOVERY SYSTEMS

The interesting Buell book — *"The van Tongeren System of Industrial Dust Recovery"* — has been especially prepared for operating executives and engineers.

BUELL ENGINEERING COMPANY, INC.
14 Cedar Street, New York 5, N. Y.
Sales Representatives in Principal Cities
DESIGNED TO DO A JOB, NOT JUST TO MEET A "SPEC"

NOMINEES FOR A.F.A. AWARDS ANNOUNCED

(*Continued from page* 99)

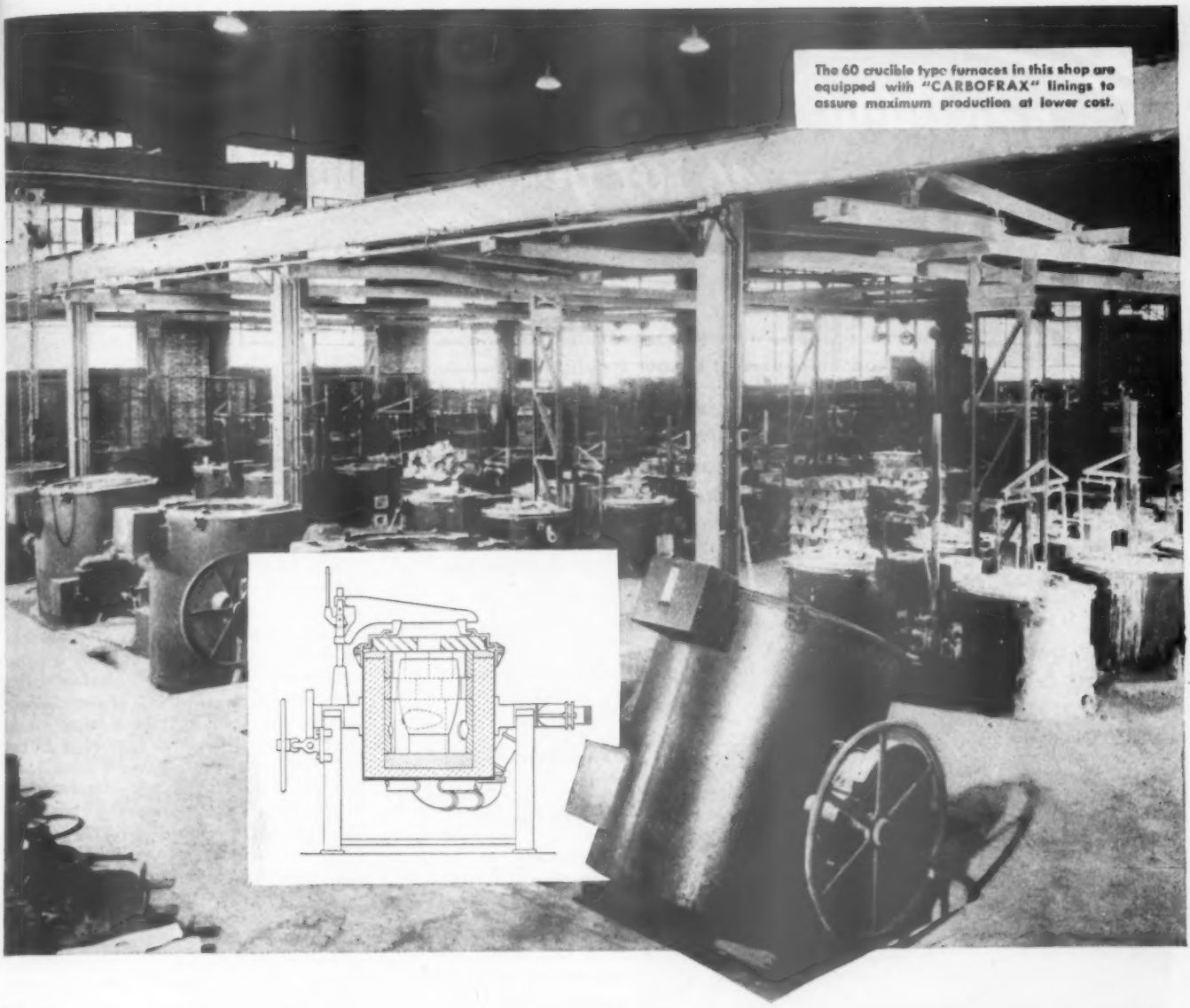
author of numerous technical papers.

Robert E. Kennedy has been identified with the A.F.A. staff since 1921 when he joined it as assistant secretary. He was elected technical secretary in 1925 and secretary in 1938. In 1943 he became administrative head of the association when the office of executive vice president was combined with that of secretary. Mr. Kennedy was graduated from the University of Illinois, where he spent a number of years as instructor and later as assistant professor in charge of foundry practice. During this period he also obtained considerable practical experience in foundry work at various plants. During World War I he served with the Ordnance Department at the Watertown Arsenal steel foundry and the Aberdeen Proving Grounds.

Rear Admr. Alexander H. Van Keuren was born in Howell, Mich., attended the University of Michigan, and upon graduation from the U. S. Naval Academy in 1903 he was assigned to Asiatic duty. He returned to the United States in 1905 on assignment to the Construction Corps of the Navy and attended Massachusetts Institute of Technology for three years, graduating in naval architecture and marine engineering with a master of science degree. Since 1908 he has been engaged in ship repair at Philadelphia, Mare Island and New York Navy Yards, inspection work at private shipyards, and in design work in the Bureau of Construction and Repair, Navy Department. Upon consolidation of the Bureau of Construction and Repair with the Bureau of Engineering into the Bureau of Ships, Admiral Van Keuren became assistant chief and later chief of that bureau. Since November, 1942, he has been director of the Naval Research Laboratory, Anacostia, D. C. While on duty in navy yards he took an active interest in foundry practice, endeavored to keep pace with improvements in the industry and to make available to industry any good features developed in naval practice. He has urged the application and extension of research and scientific methods to foundry practice and advocates closest co-operation possible between government and private industry.

M. J. Gregory, for many years active in A.F.A. committee work and as a speaker at national conventions and chapter meetings, retired last year as factory manager of the foundry division, Caterpillar Tractor Co., Peoria, Ill. He had been with the company about 15 years and had supervised the planning, erection and equipping of its foundry. Mr. Gregory served his apprenticeship with the Brown & Sharpe Mfg. Co., Providence, R. I. He attended Brown

(*Concluded on page* 186)



The 60 crucible type furnaces in this shop are equipped with "CARBOFRAX" linings to assure maximum production at lower cost.

An effective way to lower operating costs

THE CARBORUNDUM COMPANY

Dept. P-1

Refractories Division

Perth Amboy, New Jersey

HIGHER efficiencies result when "CARBOFRAX" silicon carbide linings are used in crucible-type furnaces melting brass, bronze, monel or other high nickel alloys.

Frequent and extensive patching is eliminated. With a "CARBOFRAX" lining on the job, no slagging down occurs. Flame erosion is held to a minimum too. And less slag accumulation in the bottom of the furnace helps to preserve proper combustion space—maintain constant fuel rates—reduce necessity of repeated burner adjustments.

Crucible life is also prolonged. The ability of a "CARBOFRAX" lining to hold its original shape and dimensions provides for that. Moreover, it assures a uniform heat radiation to the crucible.

A reduction in heat loss is effected. With the "CARBOFRAX" lining only 1¾" thick, the furnace can be thoroughly insulated. This means, too, that fuel consumption is decreased.

These advantages are insured by the high refractoriness, excellent resistance to spalling, durability in regard to cracking and flame erosion; and high hot strength of "CARBOFRAX" linings. Write for more information about these linings and their application to your furnaces.

"CARBORUNDUM" and "CARBOFRAX" are registered trade marks of, and indicate manufacture by, The Carborundum Company.

Super Refractories by CARBORUNDUM TRADE MARK

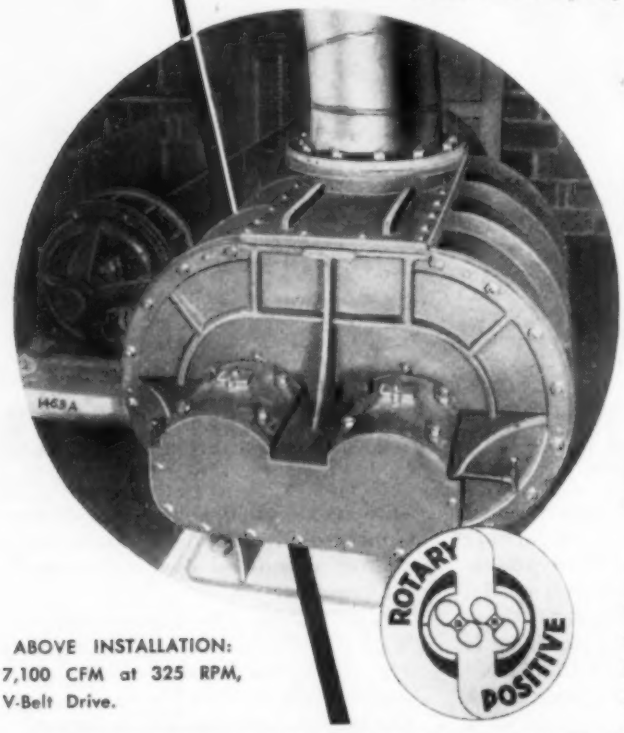
One thing "R-C" Blowers WILL NOT do for you!

The volume delivered will *not* change under the *variable pressure* conditions present in your cupolas.

The principle of positive air displacement, on which Roots-Connersville Rotary Positive Blower performance is based, assures POSITIVE air penetration of the cupola charge regardless of increases in resistance.

That's why the Foundrymen who have tried "R-C" Rotary Positive Blowers—and have witnessed the more efficient melting performance of their cupolas—are numbered among our most steadfast customers.

Other definitely superior features are—



ABOVE INSTALLATION:
7,100 CFM at 325 RPM,
V-Belt Drive.

1
Extra long life,

2
Unusual power economy,

3
Minimum maintenance costs, and

4
Reliable performance.

It is advantages such as these that have established "R-C" Blowers as "tops" for cupola service.

ROTARY POSITIVE

ROOTS-CONNERSVILLE BLOWER CORP.

ONE OF THE DRESSER INDUSTRIES

503 MADISON AVE., CONNERSVILLE, IND.

WRITE FOR BULLETIN 22-B-12

Roots Connersville SINCE 1854 — Rotary Positive CUPOLA BLOWERS

(*Concluded from page* 184)

University and studied metallography at Massachusetts Institute of Technology. Prior to joining Caterpillar Tractor Co. he was a consultant, with offices in Cleveland, in foundry and machine shop design, and previously was associated with General Motors Corp. for a number of years in similar work.

WASHINGTON Notes

OPA has authorized a 4 per cent increase in the ceiling prices for all manganese steel castings, effective Feb. 12. Reason given for the boost is that the industry has not been earning an amount equal to its adjusted 1936-1939 base period profits. Figures compiled for OPA showed that during the first 9 months of 1944 the industry earned only 2 per cent on sales or 3.5 per cent on net worth.

° ° °

Pig iron inventories have been limited by WPB to a 30-days' supply, a move occasioned by manpower shortages, bad weather and poor quality of fuel. Where special war needs require a larger stock, consumers are directed to appeal to the Pig Iron Section of the WPB Steel Division. Since Feb. 14 pig iron costs the buyer an extra $1 a ton, ceiling base prices having been raised by OPA as of that date. Foundries are not permitted to pass on the increase to casting buyers.

° ° °

ALUMINUM ingot production, curtailed a short time ago, has been stepped up by 10,000,000 pounds monthly at four plants. The increased output will come from Alcoa plants at Massena, N. Y., Badin, N. C., and Niagara Falls, N. Y., and the Defense Plant Corp. plant at Spokane, Wash.

° ° °

Use of the "spot authorization" order, permitting partial resumption of civilian goods production, has been drastically limited by increased military needs. Authorizations already granted have not been cancelled, but mill orders placed under the regulation for steel, copper in most forms and aluminum sheets are unlikely to be filled this quarter and perhaps not next quarter. New authorizations will be approved, but obtaining the required materials will prove a problem.

° ° °

NO IMMEDIATE slackening in casting requirements of machine tool builders is in prospect as orders continue to run ahead of shipments. December orders, minus cancellations, were up 5.8 per cent, while shipments rose only 1.4 per cent. This brought unfilled orders to $260,501,000, an increase of 10.7 per cent.

° ° °

Britain has bought some 58,000 American-made machine tools delivered to the United Kingdom under lend-lease, paying a little less than one-fifth the original

(*Concluded on page* 188)

THE SPO LAYOUT PROTRACTOR TABLE— For More Accurate and Faster Layouts

Use of the SPO No. 30 Layout Protractor Table simplifies the layout of patterns, core boxes and many other similar jobs. It enables you to lay out or check this work easily and accurately. Horizontal, inclined and vertical positions are quickly attained and rigidly held. The graduated rotary table, which is 30" in diameter, can be locked in any radial position desired.

NOTE: The unit, handling average weight work, can be moved to operate in any convenient position on any substantial surface plate.

★ ★ ★

The four photographs on this page show the SPO Layout Protractor Table in actual operation in a modern, well equipped pattern shop. The product is thoroughly tested, fully worthy of your confidence. It carries the usual SPO guarantee of giving you complete satisfaction.

Horizontal position makes set-ups easy. Simply place work on table and bolt or clamp in any position desired.

Table can be locked in any inclined position. Quadrant is graduated in degrees, with vernier readings.

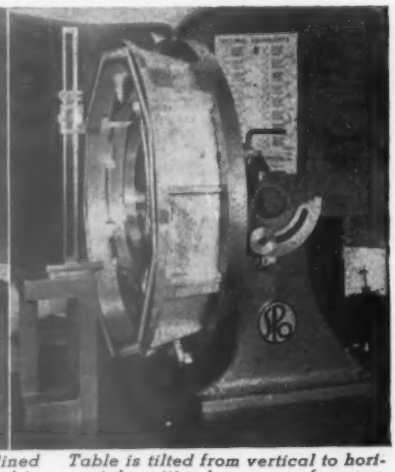


Table is tilted from vertical to horizontal position by means of a worm gear unit actuated by hand wheel.

Descriptive bulletin on SPO Layout Protractor Table will be sent upon request

MEMBER MANUFACTURER'S ASSOCIATION INC. FOUNDRY EQUIPMENT

SPO INCORPORATED

Manufacturers and Specialists in Molding Machines, Vibrators and Patterns for Production

7500 GRAND DIVISION AVENUE • • CLEVELAND 5, OHIO

Best Production Ever Recorded!

That was the unqualified verdict on Cortland Grinding Wheels, after another decisive War Production Test . . . Snagging operations in a large steel foundry in Pennsylvania were going from bad to worse — until Cortland Wheels were tested competitively against the brand then in use, with the following conclusive results:

WORK: Snagging gates and risers from castings.
Material: Hard, dense steel alloy rolls.
Machine: Fox Grinder, Swing Frame.
Wheel Speed: 8500 SFPM.

RESULTS: Competitive wheels removed gates from an average of 250 rolls. Previous high record had been 350. A Cortland Wheel, Type 1, of exactly the same size, removed 580 gates — "best production ever recorded," our sales engineer was proud to report. As a result, Cortland Wheels were made standard in the foundry.

In the extremely wide range of Cortland's abrasives, bonds, grains and wheel-types there's a combination that will solve every snagging and grinding problem *the one best way* . . . that will do *your* work faster, better and with greatly increased production per wheel.

Our engineers "know the combinations." Call on us any time — without obligation — for a practical, worth-while demonstration of new ways to efficiency and economy.

18

For Better Snagging

Write to CORTLAND GRINDING WHEELS CORP., 6 Cortland Street, Chester, Massachusetts

CORTLAND

(*Concluded from page 186*)

cost to the United States. During the war to date the British have installed 459,000 machine tools in their industries, buying 14½ per cent for cash in the United States, obtaining 12½ per cent under lend-lease and building the rest.

• • •

AN OPA study of costs in the gray iron foundry industry shows the following increases from early 1941 to late 1944: 1.1 per cent in supplies, 11.2 per cent in straight time labor and 4 to 5 per cent in overtime labor. Earnings of the industry in 1944 are reported as follows: First quarter 8.2 per cent on sales; second quarter 8.8 per cent; third quarter 6.3 per cent; 9-month average 7.8 per cent. The third quarter of 1943 was 5.6 per cent. Companies showing a loss in the third quarter totaled 33. These figures are for 125 companies for whom OPA had comparable reports since 1942.

• • •

Use of lead has been curtailed for some purposes, increased in others, by WPB order. Restrictions are tighter on certain nonessential uses, including statuary and art goods, but are liberalized on such items as lead for x-ray, abrasives and grinding wheels and storage batteries.

• • •

POLICIES have been formulated by the War Manpower Commission concerning extension of apprenticeship to returning veterans. While veterans are wanted in the apprentice ranks, proper selection is regarded advisable. WMC feels that sufficient apprentices should be enrolled to maintain a skilled force of approximately 5,000,000 persons, and that the number of establishments having apprenticeship programs recognized by the Apprentice Training Service should be increased from its present number of 32,000 to 450,000. Apprenticeship intereset is growing; last December was a record month in number of new training programs set up in industry.

• • •

Many companies in seeking priority to purchase machinery or other equipment are causing themselves unnecessary delays by not filing their priority applications with their nearest local WPB office. No application is being processed in Washington until it has been screened by the local office, and the attitude of the local office toward the project is a factor in the action taken at Washington.

• • •

MOST of the unfavorable publicity lately regarding foundry working conditions has come from labor advisory committees to WPB. The cast iron boiler and radiator group declared that the chief barrier to increased output in that industry are "intolerable" working conditions, which cause a high rate of pneumonia, tuberculosis, silicosis and industrial accidents. The cast iron soil pipe committee, contending that the industry's workers are not paid a "living wage," recently came out for better working conditions and higher prices that will permit better pay and improved facilities for workers. W.G.G.

A size "OT" Lectromelt top charge furnace in pouring position. This furnace normally pours an 8 to 12 ton heat.

MOORE RAPID *Lectromelt* FURNACES

Simplicity and ruggedness characterize the Moore Rapid Lectromelt Furnace, making it ideal for the melting of quality steels and irons. For simplified operation the use of complicated operating mechanisms has been carefully avoided without sacrificing strength and durability. Parts subjected to the greatest stress are carefully proportioned, extra strong and are made durable by the use of proper heat treatment.

Lectromelt top charge furnaces are available from 100 tons down to 250 pounds. Hundreds are in daily operation in steel mills and foundries throughout the world. Write for detailed information.

Consider the following outstanding features of Lectromelt Furnaces:

- SWING-ASIDE, ROOF-TOP-CHARGE
- COUNTERBALANCED ELECTRODE ARM TYPE OF ELECTRODE POSITIONING MECHANISM
- MULTI-PART, MULTI-CONTACT WATER COOLED ELECTRODE CLAMP
- PATENTED SPHEROIDAL BOTTOM

ARMY E NAVY

PITTSBURGH LECTROMELT FURNACE CORP.

PITTSBURGH, PENNSYLVANIA

Save WITH JIB CRANES

on Point-of-Operation Jobs . . .

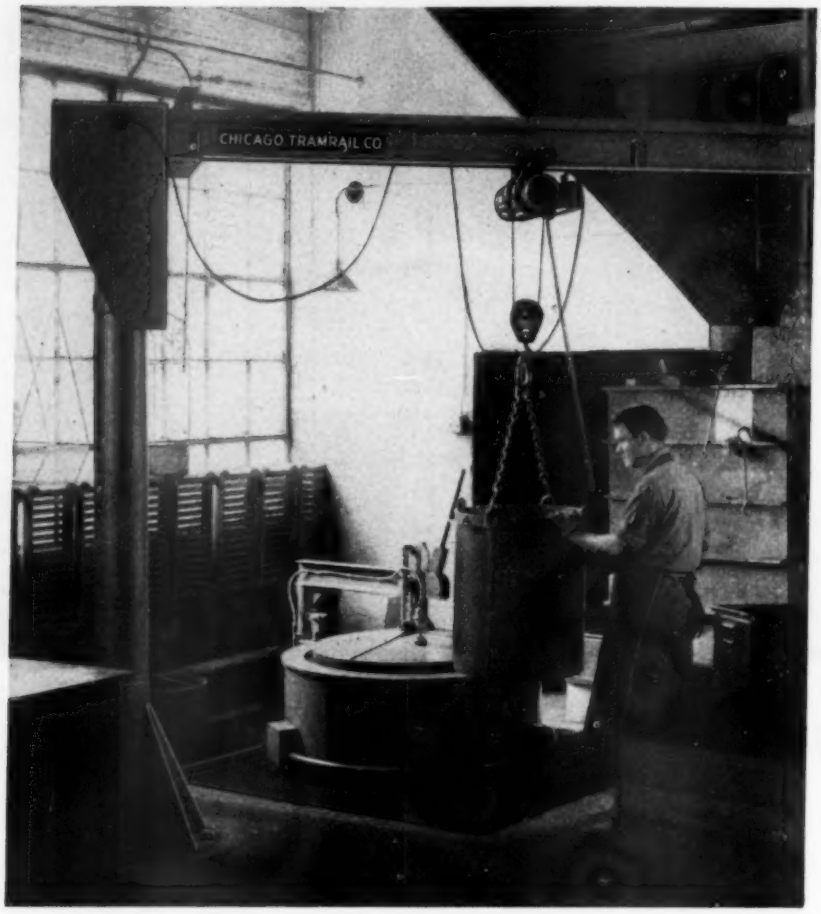
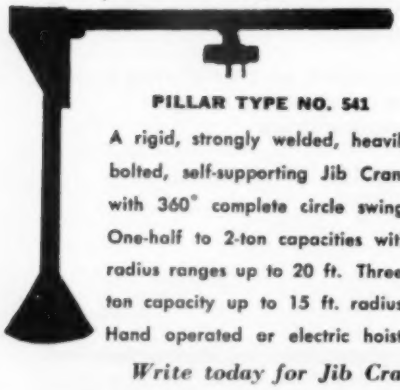


Photo Courtesy of Accurate Spring Co., Chicago, Ill.

Through the simple expedient of installing a Jib Crane at this heat-treating point of operation, one man is able to lower the container into a pot type furnace. Then, with extreme ease, the container may be lifted and swung around to the oil drench at the left. There are other points of operation in foundries where Jib Cranes will speed handling, save on help and reduce costs.



PILLAR TYPE NO. 541

A rigid, strongly welded, heavily bolted, self-supporting Jib Crane with 360° complete circle swing. One-half to 2-ton capacities with radius ranges up to 20 ft. Three-ton capacity up to 15 ft. radius. Hand operated or electric hoist.

for example:

at the "SHAKE-OUT" . . .

Operating at 360° complete circle swing, these nimble cranes take the load from overhead cranes which converge at the "shake-out". No costly tie-up or wear and tear of heavy duty equipment and you save man-power in the bargain.

Write today for Jib Crane circular. No obligation.

CHICAGO TRAMRAIL COMPANY

2910 CARROLL AVE. Phone KEDzie 7475 CHICAGO, ILL.

WEIGHING FUEL AND METAL CHARGES

(*Continued from page* 87)

limited to heat generation while with the 65-pound charge both the functions of heat generation and carburization of metal are involved. Furthermore, the 500-pound coke charge was associated with a 4000-pound metal charge in the ratio of 1 pound of coke per 8 pounds of metal, while the 65 pound coke charge, which served two functions, was associated with an 800 pound metal charge, a ratio of 1 pound of coke per 12.3 pounds of metal.

As fuel may be burned incompletely to carbon monoxide or completely to carbon dioxide or to any proportion of complete and incomplete combustion — where 1 pound of coke burned in complete combustion generates as much heat as 3 pounds of coke burned in incomplete combustion—we must recognize that any changes in cupola operating procedures which improve or deteriorate the thermal efficiency of the cupola also provides, at the time the change is effected, more or less coke for the carburizing function of the process unless the change included a proportionate change in the fuel-metal ratio. Although this article is intended to focus attention on the weighing operations, it must necessarily recognize the influence of all factors in the cupola melting process.

Use Different Scales

The four sketches concern accuracy in weighing operations, illustration *A* being the assayer's or laboratory balance, used where the nth degree of accuracy is required. Sketch *B* shows a 1000-pound dial scale (or beam scale) where the materials to be weighed are placed directly on the scale platform. The scale understructure and lever mechanism is designed to weigh 1000 pounds and the dial or beam is graduated for a 1000 pound load.

Illustration *C* is the same scale, but here the materials to be weighed are placed in some container, such as a wheelbarrow, and not directly on the scale platform. Here two loads are being measured, the gross load of the wheelbarrow plus the weight of the material in the wheelbarrow and the tare load which presumes the wheelbarrow was previously weighed. Assuming the wheelbarrow weighs 100 pounds and the material in the wheelbarrow also weighs 100 pounds, the live load is 50 per cent of the gross load. A beam scale provides a counterweight for the wheelbarrow which can be left in a fixed position if the wheelbarrow is to be used over and over again, while another counterweight is used to balance for the live load. If instead of one wheelbarrow, numbers of wheelbarrows are used which

(*Continued on page* 192)

Marabond

For Cores... Facings... Backings

Marabond is an organic binder which creates reducing conditions in the mold at the elevated temperatures existing during pouring!

CORES MADE WITH *Marabond* SHOW THE FOLLOWING ADVANTAGES:

SMOOTHER CASTINGS—Decreased Cleaning Room time and labor.
EXCELLENT COLLAPSIBILITY—No Hot Tears and easy Shakeout.
NO ACRID OR NAUSEATING GAS—In Core Room or on the Foundry Floor.
FASTER BAKING—Both Time and Temperature may be reduced.
REDUCED COSTS—Total Cost of all ingredients materially reduced.

Marabond replaces all or major portion of oil in Facing Sands—gives faster baking at lower temperature—gives better flowability—and reduces penetration.

HOT RECLAIMED SAND CAN BE CONDITIONED WITH *Marabond*

Ordinarily such hot sands promptly lose their tempering water and become so stiff as to be unworkable when the molder attempts to use them. By adding ¾%-1% of *Marabond* to this mix and tempering to 6-7% moisture, such hot black sand will automatically level out and remain at a moisture content of 3%-3½% for an extended period. This results in a constantly workable backing sand without extensive retempering on the foundry floor.

WRITE FOR ADDITIONAL INFORMATION OR SAMPLE

Produced by the Makers of L GNOLITE PATTERN PLATES

MARATHON CORPORATION
CHEMICAL DIVISION **ROTHSCHILD, WISCONSIN**

"Our metal losses run between .4% and .5% with a Detroit Rocking Electric Furnace"

A Foundry producing intricate bronze parts with a Detroit Rocking Electric Furnace Wrote recently, "Our principal alloy is 78-79% copper 2½% tin, 10% lead, 8-9% zinc, 0.5% nickel. Tests consistently showed the metal losses during melting run between .4% and .5%."

Records in scores of foundries show similar low metal losses and many other advantages. Detroit Electric Furnaces require less labor and produce more pounds of perfect castings per man-hour. They produce as many as 8 ferrous or 16 non-ferrous heats in one eight-hour day. Because they allow precise metallurgical control of any formula, Detroit Furnaces assure superior metallurgical results. Built in capacities from 10 to 8,000 lbs. Write today for further facts.

DETROIT ELECTRIC FURNACE DIVISION
KUHLMAN ELECTRIC COMPANY • BAY CITY, MICHIGAN

(*Continued from page* 190)

vary in weight from 90 to 110 pounds, assuming the wheelbarrow counterweight is not moved from 100 pounds and that the gross weight on the scale is still 200 pounds, then the actual weight of the live material varies from 90 to 110 pounds and what appears to be a reasonably accurate weighing operation is introducing weighing errors of 10 per cent.

Generally, the smallest weight units in cupola charge materials are concerned with the materials that should be weighed with the greatest accuracy, such as the 80 pounds of silvery pig in the 800-pound metal charge, so weighing facilities should be sufficient to do a good job on the smallest ingredient rather than on the whole charge.

Illustration *D* may appear to be an absurd weighing condition, for the load on the scale weighing mechanism includes a truck, container and charge materials. Three items weigh 7100 pounds, but only 100 pounds represents the actual charge. The truck is used here but it is intended to be representative of any number of mechanical devices, such as industrial cars, bucket loaders, hoppers, etc., where considerable weight is involved.

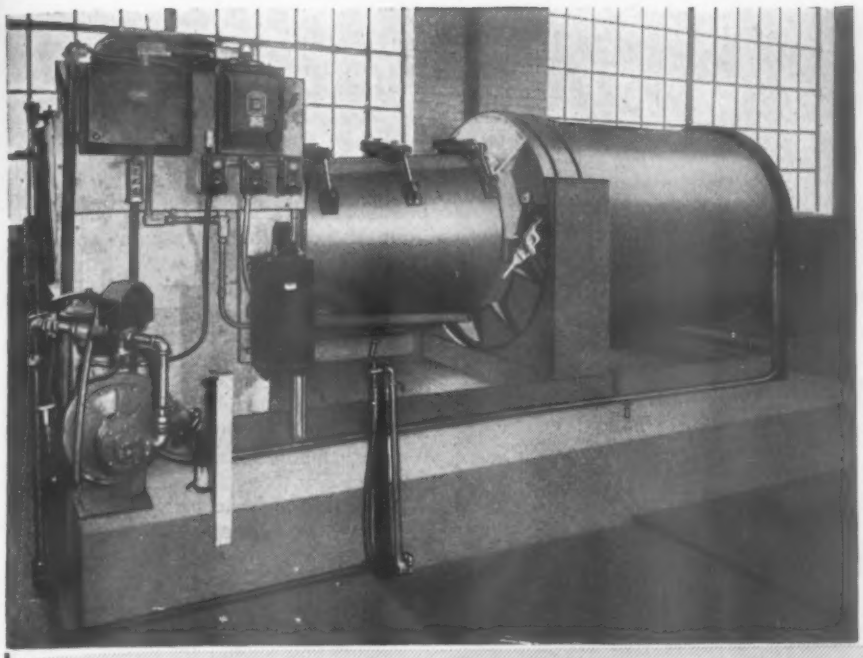
Scale Must Be Strong

It probably would be argued that no one would use a 6000 pound truck and a 1000 pound container while weighing 100 pounds of charge material, but even though the total charge weighs several thousand pounds some ingredient in that charge is likely to weigh more or less than 100 pounds, and the function of weighing that ingredient is properly illustrated. It should be noted that the scale mechanism is designed for 20,000 pounds, while the load on the scale is only 7100 pounds. If charge materials are dumped from a magnet while the charging bucket is on the scale or if the scale is mounted on a scale car, the scale mechanism must be built sturdy enough to withstand whatever impact is imposed by the conditions of service, and though the total weight load that may be on the scale platform may not be over 5000 pounds, the conditions of service may require the construction sturdiness of a 20,000 scale.

The manufacture of a dial scale usually graduates the dial face so that with a 1000, 5000, or 20,000-pound scale mechanism each scale division represents 1, 5 or 20 pounds, respectively. That is, if we weigh 80 pounds on a 1000-pound scale mechanism, it is quite likely that we will not be off more than 1 pound or that the true weight will be in the range of 79 to 81 pounds. However, if we weigh 80 pounds on a 20,000 pound scale mechanism the true weight, when the scale is in first-class condition, might vary between 60 and 80 pounds.

Whenever some type of bucket loader, container, truck or other device is to be weighed each time some ingredient in the charge is weighed, then every effort

(*Concluded on page* 194)



Automatic Handling of Stars . . . Easy . . . GENTLE . . . Economical . . . Not Self-Destructive

Ransohoff

WET CLEANING MILLS

In Step With The Swift Pace Of The War Effort; Better Cleaning With Savings Of 30% To 70%

Lagging here means prolonging "over there" . . . old-fashioned cleaning methods slow up production, drag down quality of finished work, make costs soar. TO ECONOMIZE YOU MUST MODERNIZE and with these mills you turn your foundry into an efficient, swift-moving, costs-cut-to-the-bone organization with production stepped up and profits in proportion.

Two views above show a RANSOHOFF Side-Loading, End-Unloading wet mill cleaning miscellaneous grey iron castings. Small work is dumped in; and unloaded automatically from the end. Large or fragile work is packed into the drum and unloaded from side.

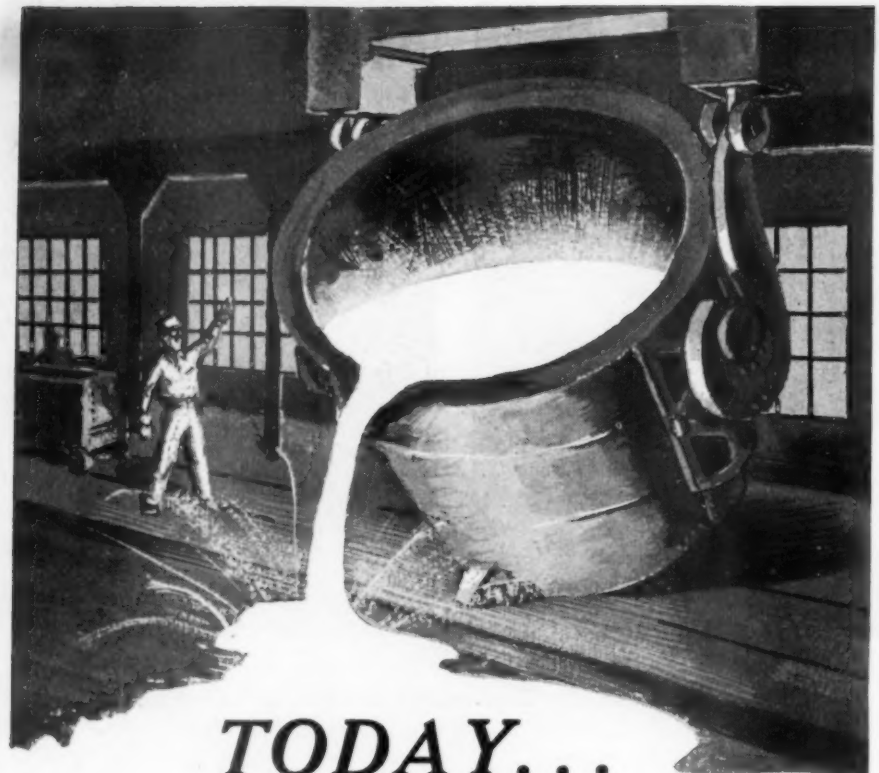
In a RANSOHOFF MILL castings cascade in a mass with stars intermingled without voids. Stars enter and return automatically. No breaking, nicking or mill wear. No dust collectors needed. Mills are not self-destructive.

SEND US A SAMPLE BATCH. CONSULT RANSOHOFF FIELD ENGINEERS.

N. Ransohoff, Inc.

MANUFACTURER'S ASSOCIATION, INC. FOUNDRY EQUIPMENT

TOWNSHIP AND BIG 4 R R CINCINNATI 16, OHIO



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America's Largest Producers of Alloys

BUFFALO 17, NEW YORK

(*Concluded from page* 192)

should be made to keep the tare weight of this device as little as engineering skill can devise.

Whenever scales are to be mounted on scale cars and transfer cars, or where charges are to be made up in some device resting on the scale mechanism where materials drop from a bin or magnet, the conditions of use and abuse will determine the degree of ruggedness which must be built into the scale mechanism. Not long ago a rather comprehensive rearrangement of a foundry melting department contemplated an 8000-pound tare weight on the scale mechanism where the total metal charge would be 2000 to 3000 pounds and where some ingredients in the charge would be small fractions of the weight of the iron charge. It would be practically impossible to achieve an optimum quality product with this type of engineering in weighing operations.

The accuracy of scale should be checked periodically with standard weights and should be serviced periodically by a competent maintenance man. Repeated investigation of the condition of scales in the cupola charging department shows that they are seldom in first-class working order and need both maintenance attention and checking with standard weights.

One of the greatest variables in the melting department and in the quality of the material produced in the gray iron foundry is concerned with the job of weighing raw materials, and if we are willing to go through the motions of weighing we should be willing to go one step farther and demand a high order of weighing accuracy for each ingredient in the metal charge and in the fuel charge.

There are many details concerned with an outstanding melting operation and an ability to produce the tops in gray iron quality, but an essential to both achievements is precision in dealing with charge materials.

Book Review

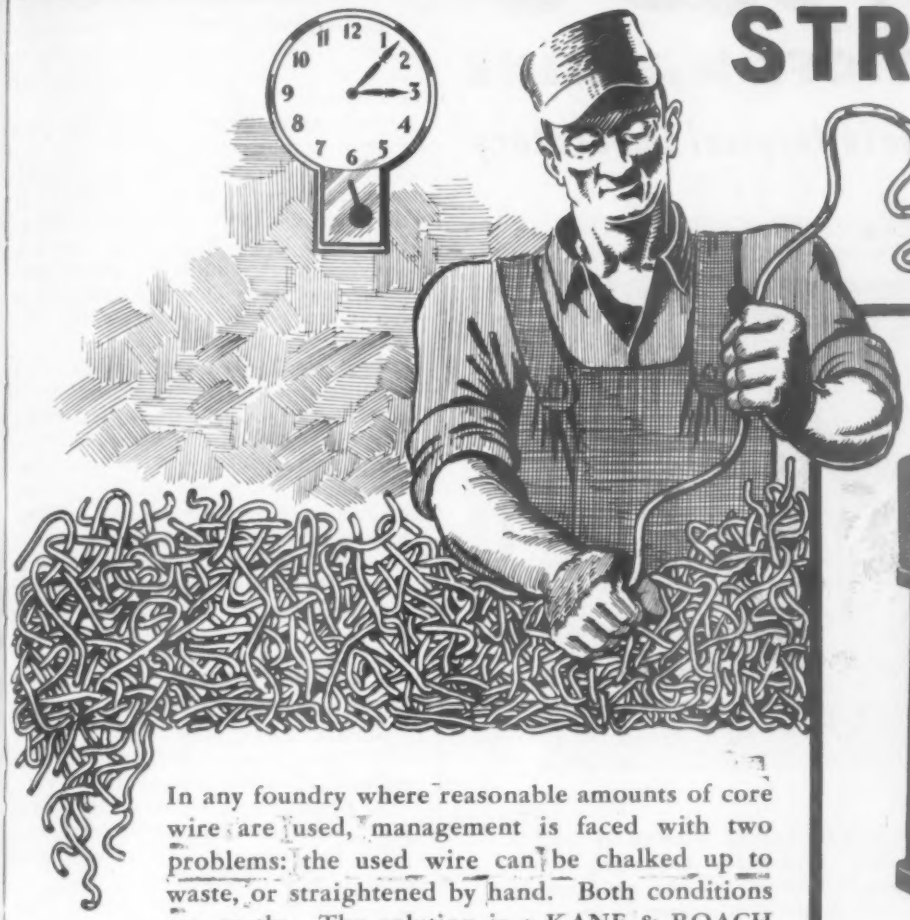
Simplified Time Study, by Herbert J. Myers; published by the Ronald Press Co., 15 East Twenty-sixth street, New York. Price $2.50.

To aid supervisors, foremen, shop stewards or others to use time study for their own purposes and to make a practical time study themselves if necessary to obtain information, this treatise has been compiled. It grew out of a need in a company operating in many locations, none sufficiently large to afford a resident time study engineer.

For every occasion that calls for detailed study by a professional engineer there are many where a practical study can be made by a supervisor. The book's object is to make the subject as clear and simple as possible. Thus the explanation has not been complicated by technical refinements yet is complete and adequate. Anyone can follow the instructions and obtain dependable results useful in his work.

Are you paying your coremakers a high hourly rate to **MAKE CORES** . . . . . or to

STRAIGHTEN WIRES?



DX 5-Roll Core Wire Straightener

In any foundry where reasonable amounts of core wire are used, management is faced with two problems: the used wire can be chalked up to waste, or straightened by hand. Both conditions are costly. The solution is a KANE & ROACH CORE WIRE STRAIGHTENER. It reclaims used core wire quickly, cheaply and efficiently, over and over again, just as long as the wire remains usable. Foundries in which they are installed report an average saving of $100. a month in total salvage and man hours, not to mention increased production. Machines can be furnished in two sizes with 5, 8 or 9 rolls. Capacity DX Machine—1/8" to 3/8": F Machine—3/16" to 3/4". A Shear can be furnished for use with this Straightener for straightening and cutting new coil stock to length. Because we have been building and designing Straighteners since 1887, we feel that our knowledge and experience may help you. We will be pleased to send you specifications and other data on request.

K & R

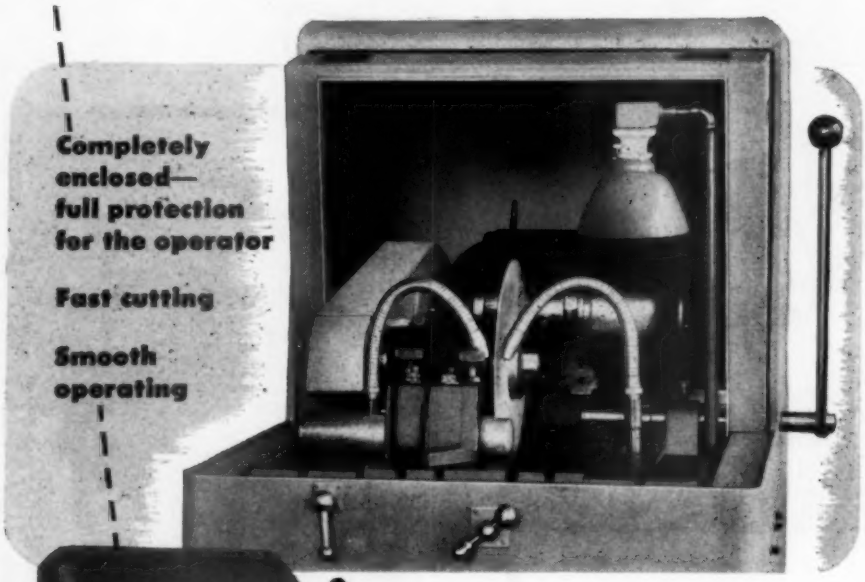
KANE & ROACH

INCORPORATED
SYRACUSE, N. Y.
ESTABLISHED 1887

Buehler

ABRASIVE CUT-OFF MACHINE

. . . for the Metallurgical Laboratory



Completely enclosed— full protection for the operator

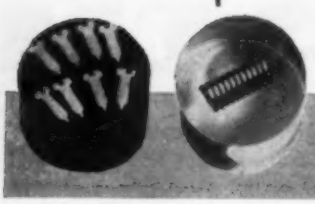
Fast cutting

Smooth operating

Model 1000

The Buehler Cut-Off Machine No. 1000 is a solidly built heavy duty machine free from vibration and side play with capacity for cutting specimen sections up to 3-1/2". Cutting is done on the front of the wheel and is controlled by a convenient outside lever. With the cover closed, the cutting operation can be viewed through a heavy wired glass window. Regular equipment includes 3 HP totally enclosed ball bearing motor 1750 r.p.m., 220 v., 60 cycle, AC, 3 phase; pump motor 1/4 HP, 220 v., 60 cycle, 1 phase; six cut-off wheels 12"x 3/32"x1-1/4". Wheels not in use are stored in a spacious compartment in the base, which also contains a removable sludge collection chamber. The self-contained cooling system provides a flood of water for cool cutting. Overall dimensions 31"x 47"x64". Shipping weight 1400 pounds.

The Buehler line of specimen preparation equipment includes . . . . .
CUT-OFF MACHINES • SPECIMEN MOUNT PRESSES • POWER GRINDERS
EMERY PAPER GRINDERS • HAND GRINDERS • BELT SURFACERS
POLISHERS • POLISHING CLOTHS • POLISHING ABRASIVES



Buehler Ltd.
A PARTNERSHIP

METALLURGICAL APPARATUS
165 West Wacker Drive, Chicago 1, Illinois

PROGRESS IN MALLEABLE MELTING

(*Continued from page* 91)

tion, sulphur is within an acceptable range. In extreme cases sulphur can be reduced in a continuously desulphurizing forehearth.

Oxidization losses in duplexing from cupola to pulverized-coal-fired air furnace range from 4 to 7 per cent depending on the quality of scrap charged. In the usual duplexed malleable charge an average of about 70 points in carbon is absorbed by the iron in the cupola, with an average loss of about 15 per cent of the silicon and 20 per cent of the manganese.

In the air furnace there will be a loss of 10 to 40 points of carbon, an average of 7½ per cent of the silicon and 10 per cent more of the manganese. Based on our present knowledge of the most favorable cupola design and using a good average size of hard, dense, slow burning, low sulphur coke, we will assume that the final sulphurs will run from 0.10 to 0.14. The ingoing cupola charge should then be approximately as shown in Table III.

Favors Continuous Melting

The important benefits derived from continuous melting are:

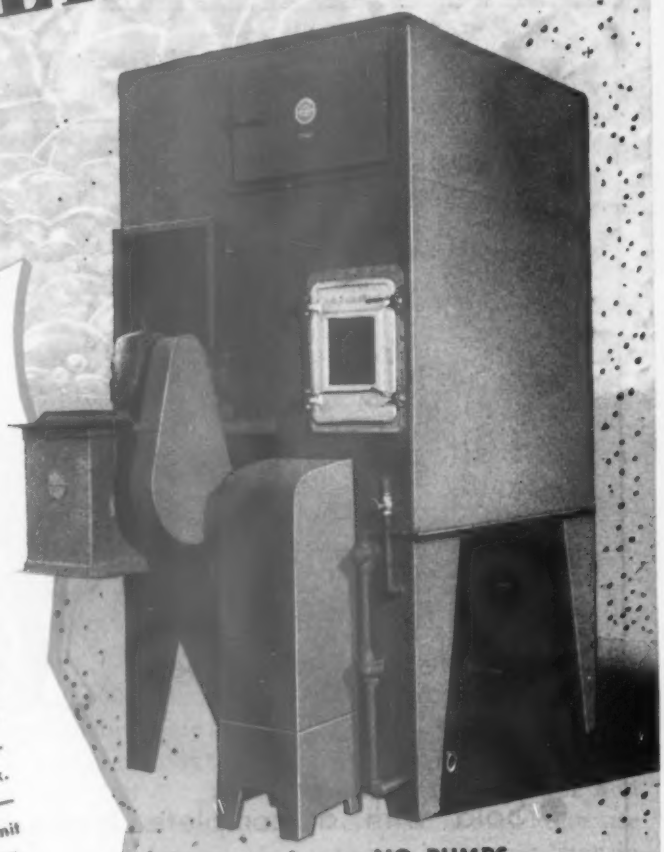
1. Greater production per molder because he does not have to stop to pour.
2. Less labor for core making, annealing, trimming, milling and shipping because these departments are not called upon to shift during heats.
3. Cleaner and more pleasant shop conditions, since gas and dust are readily collected by hoods over mold conveyor and shakeouts. Cleanliness is an increasingly important factor to those foundries that expect to minimize labor problems.
4. Greater production per manhour, because mechanical handling of all material is possible.
5. Higher quality of product, because more accurate control of all operations is possible on a continuous basis. Savings in other departments permit spending more money on supervision and control of the melting process.

A few malleable plants have found continuous melting advantageous without mold and sand handling equipment. By pouring the molds for the molder, he is permitted to put up more molds, increasing casting production per molder from 10 to 30 per cent. Continuous melting equipment is now available in capacities from 4 tons to 25 tons per hour and up to 16 hours operation per day.

Several of the smaller foundries using the cupola-air furnace system for duplexing continuously have only one cupola and one air furnace, others that do not

(*Concluded on page* 198)

DUST...*under water*
is dust UNDER CONTROL



SAFE • SURE • DUST ELIMINATION with the MAHON Hydro-Foam SYSTEM of DUST COLLECTION

The thoroughness with which the Mahon Hydro-Foam Dust Collector clears production areas of harmful dust is due to the *patented* MAHON FOAM CONTROL, devised and perfected by Mahon engineers. By means of a powerful suction-exhaust fan the dust-laden air is drawn through ducts to the Unit, where the heavier dust immediately drops by gravity into a sludge tank located in the base. The finer, more minute dust particles are "smothered" in a foam bed above the water line, eventually settling also to the bottom of the sludge tank. Thus, the dust is trapped the SAFE way—*under water*—as the dust-laden air stream travels through the Unit and emerges from the exhaust stack thoroughly clean. If you are interested in this advanced method of dust elimination—whose greater safety, simplicity and economy has been definitely proved in practice. . .

Write for Descriptive Folder

- NO PUMPS
- NO SPRAY NOZZLES
- NO CLOTH SCREENS
- NO MOVING PARTS, EXCEPT PAN
- COMPETELY AUTOMATIC

REMOVES THE DUST FROM INDUSTRY

INDUSTRY

THE R. C. MAHON COMPANY

DETROIT 11 — CHICAGO 4

Designers and Manufacturers of Metal Cleaning Machines, Rust Proofing Machines, Hydro-Filter Spray Booths, Ovens of All Types, Filtered Air Supply Systems, Hydro-Foam Dust Collectors—and Many Other Units of Special Production Equipment—Including Complete Finishing Systems.

(*Concluded from page* 196)

want to repair the cupola each night have two cupolas and one air furnace. Many of the latest installations have a spare cupola and a spare air furnce; this permits repairing the cupolas in the daytime, the furnaces during the week in regular hours without overtime pay and under the constant supervision of the melting foreman, and operating the furnace for 10 to 15 days which is not possible when repairs cannot be made during the week. Consequently, refractory costs are considerably less with a spare furnace.

Pulverized coal is the ideal fuel for the holding furnace due to its ability to produce high temperature and the possibility of flame control; an oxidizing flame or a non-oxidizing or neutral flame can be maintained. The unit impact pulverizer is preferred because fine coal can be fired while the cupola is supplying iron to the holding furnace during which time the temperature of metal must be increased and carbon reduced.

When the cupola has melted the requirements for the day the fineness control at the pulverizer is adjusted to supply the correct amount of coarse coal to stop carbon reduction, and the coal-air supply controlled to maintain the desired temperature. When the holding furnace can be drained within 2 hours after the cupola stops melting it is usually unnecessary to add any carbon excepting that supplied by the pulverizer.

Practically all new cupola-air furnace duplexing holding furnaces are of the ventilated bottom design. This type of furnace permits melting operations up to 16 hours per day without bottom failure.

Several additional malleable foundries now are considering the installation of continuous melting and material handling equipment. The larger plants making one kind of iron will install cupola-air furnace or cupola-electric duplexing.

For continuous melting under four ton per hour per unit, there is available a continuous rotary melting furnace which is capable of producing a continuous supply of iron of any desired analysis, with carbons from 1.50 to 3.00, all in one self-contained unit. This furnace is useful for the small foundry that wants to melt continuously or the larger foundry that wants to produce more than one grade of malleable in quantities under 4 ton per unit.

Only four malleable plants in the United States do not have mechanically-fired melting equipment. Undoubtedly these plants will install pulverized coal on their present batch melting furnaces, or some may decide to adopt the continuous process to reduce melting costs and improve the grade of metal. Five plants are melting with oil, two of these in California where oil is cheaper than coal.

SCHUNDLER
BENTONITE

- A laboratory controlled, first quality product especially "tailored" for Foundry Use
- Offered by a pioneer producer

- Sold with a complete technical service . . . available on request . . . fitted to your individual needs
- Stocks located in principal cities

F. E. SCHUNDLER & CO., INC.
520 RAILROAD STREET • JOLIET, ILLINOIS
SCHUNDLER
BENTONITE

Alloys Are Saved by Scrap Melting

(*Concluded from page* 93)

Limits are set up by the plan which are recalculated every ten groups. These limits depend upon the average of averages and the range average for these same groups. The range value is the difference between the high and low individual value on each group and the limits are similar to those previously described. There are upper and lower limits for the yield point and percentage of elongation both for individual values (extreme upper and lower dotted lines) and for group values (intermediate dotted lines). The heavy solid line in the middle is the average of averages. The upper limit for ranges is the dotted line while the lower limit is always zero. The average of ranges is the heavy solid line. There are many additional rules in the plan to take care of unusual and out of the ordinary situations which arise under this type of control. Space does not allow a discussion of these unusual cases.

Acquires Company

C. J. Tagliabue Mfg. Co., Brooklyn, N. Y., manufacturer of industrial control and laboratory instruments, has been acquired by Portable Products Corp., Pittsburgh. Name of the Brooklyn company will be retained and the business will be operated as a separate division of Portable Products Corp.

TREBLE THE PRODUCTION OF EVERY MAN?

★ HERE'S HOW! ★

Do you make small, medium, or large castings in your foundry? All are important these days as are their quantity and quality.

Herman engineers have been whipping tough molding jobs for more than forty years and have developed the "know-how" that has made the name HERMAN world-famous in foundry circles. These engineers will be glad to study your molding problems and specify the size and type Machines that will best suit your requirements.

MEMBER MANUFACTURERS ASSOCIATION INC. FOUNDRY EQUIPMENT

Jarring and Jarr Stripping Machines are available in any size or capacity up to 140,000 pounds. Jarr Rollover and Pattern Drawing Machines are available in a variety of sizes ranging from 750 pounds to 40,000 pounds rollover capacity in Pitless and Pit Types. Independent Rollover and Pattern Drawing Machines are also available for use with Plain Jarring Machines you may now have in operation.

Regardless of which Herman Molding Machine you choose, you are assured of highest efficiency, greatest speed, and minimum maintenance for the entire service life of every Herman. We'll be glad to discuss your problems with you.

ARMY NAVY E

MOLDING HERMAN MACHINES

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH, PA.

PERMANENT MOLD CASTINGS

(*Continued from page* 102)

feeding gates in the bottom of the die do not offer any effective choke for the ingoing metal—if they did the runner could not also act as a feeder—the die has to be tilted to avoid turbulence in the bottom of the mold.

It has been found that despite the inevitable complications introduced by incorporating loose pieces or pick-off pieces in gravity dies, their use still results in a high rate of production and, provided the pieces themselves and their location are designed and constructed properly, no technical difficulties are encountered.

The policy of manufacturing as die castings as many parts as possible on the Merlin engine is obviously very keenly pursued when one considers that the latest venture is a gravity die for producing cylinder skirt castings, the casting itself measuring 3½ feet in length and weighing 53 pounds.

Very careful consideration has entered into a design of running system for this job which will insure castings being metallurgically sound, and the decision arrived at is illustrated in a photograph (Fig. 10), of a casting complete with runners and risers. The metal enters the mold, in a theoretically ideal manner—at the bottom, through a system of 12 ingates, each measuring 2 inches wide x 3/16-inch thick, from a channel runner along each side of the casting. A sloping runner is situated at each end of the die leading into the channel runners.

The relative cross-sectional area of the various parts of the running system are such that the metal is choked at the ingates, thus insuring that the system is kept full during the casting operation. In this way oxide formation is kept to a minimum, but should any be carried down with the metal it stands little chance of entering the mold cavity due to the fact that the metal enters the ingates from a position almost at the base of the channel runner, as shown in the enlarged portion of the cross section (Fig. 9). This feature has necessitated the use of loose steel inserts behind the runner, which are knocked out from the casting after removal of the die. A large open feeder completely covers the top surface of the casting and is afterward removed by circular saw.

Inside Formed With Core

Die for the cylinder skirt consists essentially of two main die blocks, forming the outside of the casting, and a base, while the inside of the casting, which is relatively intricate, is formed with one large sand core.

Because of their size and weight the die halves are opened and closed by means of two 2½-inch diameter acme-threaded screws on each side, actuated by levers. In the closed position the halves are securely clamped together at the ends by cam-action clamps.

The design of the die base illustrates some of the problems encountered when a job of this size and description is undertaken. The most serious problem is to prevent the base cracking on the outside due to the bursting stresses set up when the center inevitably becomes heated to a higher temperature than the outside, with the consequent greater expansion. The solution lies in (1) heating all sections of the die uniformly initially, and (2) maintaining it in that condition. To do this a system of heating, by means of gas pipes placed in the die base, has been incorporated whereby heat may be applied uniformly over the whole area. During actual operation it is necessary to turn off the gas pipes in the center of the die, as this is maintained at a uniform temperature by heat from the metal flowing through the running system. Many strengthening webs are provided to insure rigidity.

The problems inherent with unequal expansion due to varying degrees of heat have also to be contended with in the design of the main die halves. It will be seen from the cross section (Fig. 9) of the die that each die half is built

(*Continued on page* 202)

FRICTION SAWING
SHEET STEEL Formed or Flat
NON-FERROUS METALS Formed or Flat
ARMOR PLATE
SOFT or HARDENED STEELS
PLASTICS
GLASS and Other Materials
By Arthur A. Schwartz
Chief Tool Research Engineer
Bell Aircraft Corporation
WRITE FOR FREE COPY OF THIS VALUABLE BOOKLET
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this method is rapidly displacing other cutting methods. Learn all about it and the machines that make it possible —
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HIGH SPEED BAND SAWS
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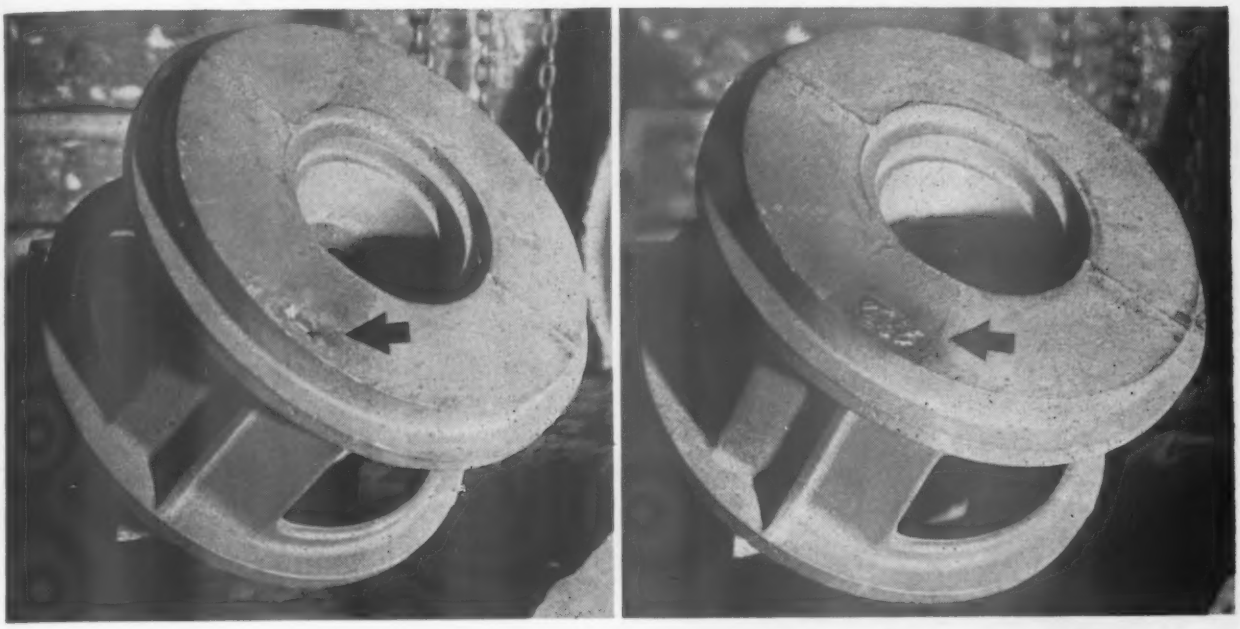
YOU CAN MACHINE IT OR DRILL IT ANY WAY YOU LIKE



Defect in gray iron casting . . . . . Welded with PHILLIPS "600"

THE foundry welder knows. Foundries have been using PHILLIPS "600" Electrode for salvaging gray iron castings for years. One good reason why PHILLIPS "600" is the preferred rod for foundry salvage work is that the deposit is completely machinable *even through the line of fusion.*

Further, deposits of PHILLIPS "600" are as strong as cast iron and of the same color. Thus, with a very little material and a very few minutes of welding time, castings with small defects are restored, and at only a trifling cost per casting.

C. E. Phillips and Company carry in stock a complete line of electrodes for salvaging and repairing iron castings. For your guidance in selecting the correct electrode for each type of application and the best procedure for using each electrode, we have prepared the manual of arc welding procedures for cast iron illustrated here. To get the best results on every job, it is essential that you follow these practices which have been proved by long experience.

This free manual is a complete guide to the selection of materials and procedures for arc welding cast iron. Send for your copy TODAY.

We carry in stock 145 different kinds (not sizes) of welding rods and electrodes. If a rod for your special problem is available, *we have it.* Catalog and price list on request. Distributors in all principal cities.

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MANUFACTURERS AND DISTRIBUTORS OF WELDING ELECTRODES AND SPECIALTIES

(*Continued from page* 200)

up in three layers. The bottom piece, which is comparatively thin, forms part of the casting and running system and, since it becomes heated to a greater degree than the remaining sections, it is not secured to any other section of the die block but is only located by means of keys, thus enabling it to expand freely longitudinally. A similar principle is included in the top blocks forming the feeding heads.

As stated previously, the inside of the casting is formed by one large sand core. This is constructed in four main sections, which are afterward assembled in a special metal trough and secured by means of long bolts and a cast iron strap along the top of the core prints. Eleven coolant-liquid-transfer-port cores are assembled into the body core and secured in position. The complete core assembly is in this way handled in one unit and placed in the die on steel dowels fitting into corresponding locations in the metal core carrier, thus insuring ease and safety in handling with consistently accurate positioning relative to the die cavity.

It is hoped that the detailed description of the aforementioned typical dies will have illustrated fully to the reader just how valuable and indispensable is the die development department to the mass production of sound gravity die castings. Every casting on the Merlin engine is treated by this section as a Class I inspection piece, although, officially, none is classified as such, and it is accordingly the practice that no die may be released for production until perfectly sound castings are assured.

By setting this target, the high standard of quality demanded of all Rolls-Royce products is practically guaranteed, and at the same time an important safety margin is automatically introduced to cover any slight reduction in metallurgical and dimensional quality inevitably encountered under rigorous production conditions. In this respect, the radiological examination of castings is employed very extensively during die development as a means of investigating the effect of different methods of die preparation and casting technique on the quality of a particular casting.

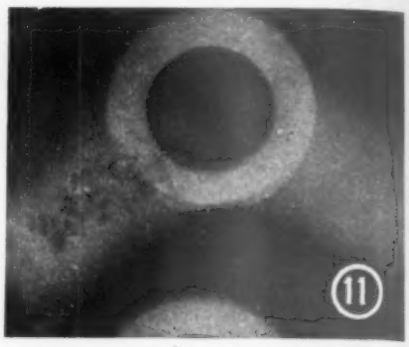

Fig. 11—*Radiograph of spray nozzle body casting revealing shrinkage cavity*

Defects, such as shrinkage and occluded bubbles of air, are readily detected by this examination, and when the occurrence of these is studied in relation to both the relative thermal conditions in different sections of the die and to the casting technique, most valuable data on die design and the theory of casting are obtained, thus making the rapid elimination of faults more certain. By making a specialized study of each design in this manner, considerable scientific knowledge has been rapidly accumulated.

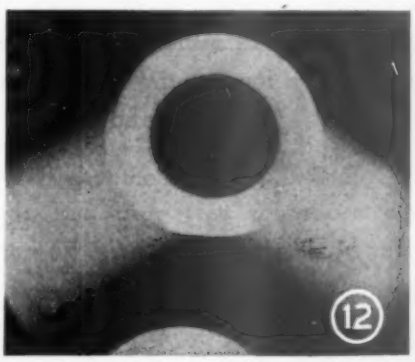

Fig. 12—*Radiograph of sound spray nozzle body casting*

To illustrate the high quality

(*Concluded on page* 204)

RIGHT MISTER . . . it's not the volume, but the *weight* of air supplied to cupolas that controls combustion. Progressive foundries, switching to Sturtevant Centrifugal Compressors, are using exact weights of air in relation to temperature and humidity—and hence are getting improved micro-structure of castings, and better control of chemical analysis. Savings effected by higher iron-coke ratios often pay for a Sturtevant Unit (with controls) within a year. And there are labor savings, too—made possible by the faster melting rate of cupolas.

Not only do Sturtevant Cupola Blowers assure even flow without pulsation, but they also lighten your repair load, delivering long, uninterrupted service with practically no attention needed, due to simple strong and compact construction. Check these high-value Sturtevant features:

1. Wide clearances in the housing mean lifetime efficiency.
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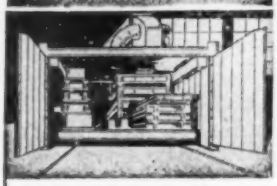
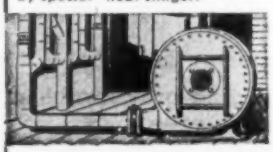
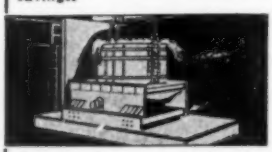


Sturtevant Core Oven Fans—handle dirty dust-laden air with no loss in efficiency. Shafts cooled by special "heat-slinger."



Sturtevant Compressors—hold air pressure constant, in supplying blast to oil or coke burners. Lifetime efficiency, minimum maintenance; worthwhile power savings.



Sturtevant Foundry Shake-out Systems—completely control dust and fumes, increase worker efficiency and equipment life, cut down maintenance.

Sturtevant Dust Control—pioneer experience in engineered systems for collecting dust from snagging, tumbling and sand-blasting operations.

Sturtevant Fume Control—efficient tailor-made systems for production foundries or low-operating-cost equipment for jobbing shops.

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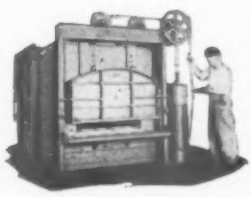
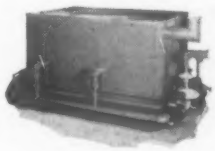
40,000 lbs. Per Load

This Radiant convection recirculating car type furnace holds 40,000 lbs. of fabricated steel parts and raises them to 1150°F. at a rate of 6000 lbs. per hour. It holds this temperature to plus or minus of 5°F. Sand sealed throughout including the door, this furnace is practically leak-proof. Distributed by ducts, flue gases blow across the heating chamber from wall to wall, thus bathing the entire charge uniformly. Convection furnaces are built and guaranteed by us up to 1700°F. Radiant Combustion tailor-made furnaces, designed to definite specifications, will increase production and efficiency in your heat treating department. Write for information.



BOX TYPE FURNACE heats 2"x3'x7' steel plates. Combination gas or oil fired, even temperature, heavy construction for long life. Hearth area is 3' x 8'.



RECTANGULAR LEAD POT, annealing 75mm. shot, production 100 shells per hour, 42" long x 18" wide x 14" deep inside. Constructed of 3/4" steel plate. 1250° F. temperature. Hood and flueing not pictured.

ROTARY TYPE 10 ft. hearth operates at 1650° F., heat treats 2000 lbs. of steel per hour. Smooth operating due to special hearth mechanism. Six of these now operate in one plant.

Radiant Combustion, Inc

BUILDERS OF EVERY TYPE (OIL, GAS, ELECTRIC) OF HEAT TREATING FURNACE

WARREN, OHIO

(*Concluded from page 202*)

achieved and also the value of radiography on die development, a few typical examples are given, showing details of faults disclosed by x-ray and the methods adopted to overcome them. The reader will, of course, appreciate that in the average die casting the flaws are normally fairly small in size on the original negative, and also that a certain amount of definition is lost upon reproduction, but it is hoped that the faults can be detected on the illustrations shown.

Fig. 11 is a radiograph of a sample casting of the first batch of castings taken from the spray nozzle body after leaving the tool room. The shrinkage cavity disclosed on the negative revealed to the designer that insufficient feed to the casting had been provided for, and accordingly the die had to be returned to the tool room for modification.

After rectification by altering the shape of the feeder on the defective branch, perfectly sound castings were obtained (Fig. 12).

Radiographs taken of the first castings produced of the front gear case cover disclosed the presence of air inclusions—a defect which could not have been revealed by any form of non-destructive test other than radiography.

Occluded bubbles of air is a fault normally associated with turbulent metal, and when this defect was detected it was apparent to the designer that very strict attention to the method of pouring was necessary. By regulating the speed of pour to synchronize with the relative time and speed required to return the tilted die to the horizontal position, this fault was eliminated, as was revealed by the subsequent radiographs.

Prior to the release of the rocker cover die to the production foundry, radiographs taken of sample castings produced disclosed the presence of shrinkage cavities and, in this particular case, the course adopted to overcome this fault was the modification of the method of coating the die.

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HERE IT IS!

Isn't it true that you've made many an inquiry to find the very best belting to handle hot shakeout sand?

If you haven't tried SAHARA, a very pleasant surprise awaits you. BUT FIRST be convinced by genuine results — remarkable performance records (many exceeding all competition to as high as 100%) established in the world's largest, most progressive foundries.

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P.S. REXALL is equally good for cold sand and castings.

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Book Review

Materials and Processes, edited by James F. Young, Engineering Division of the General Electric Co., Schenectady, N. Y., 628 pages, published by John Wiley & Sons, Inc., New York. Price $5.

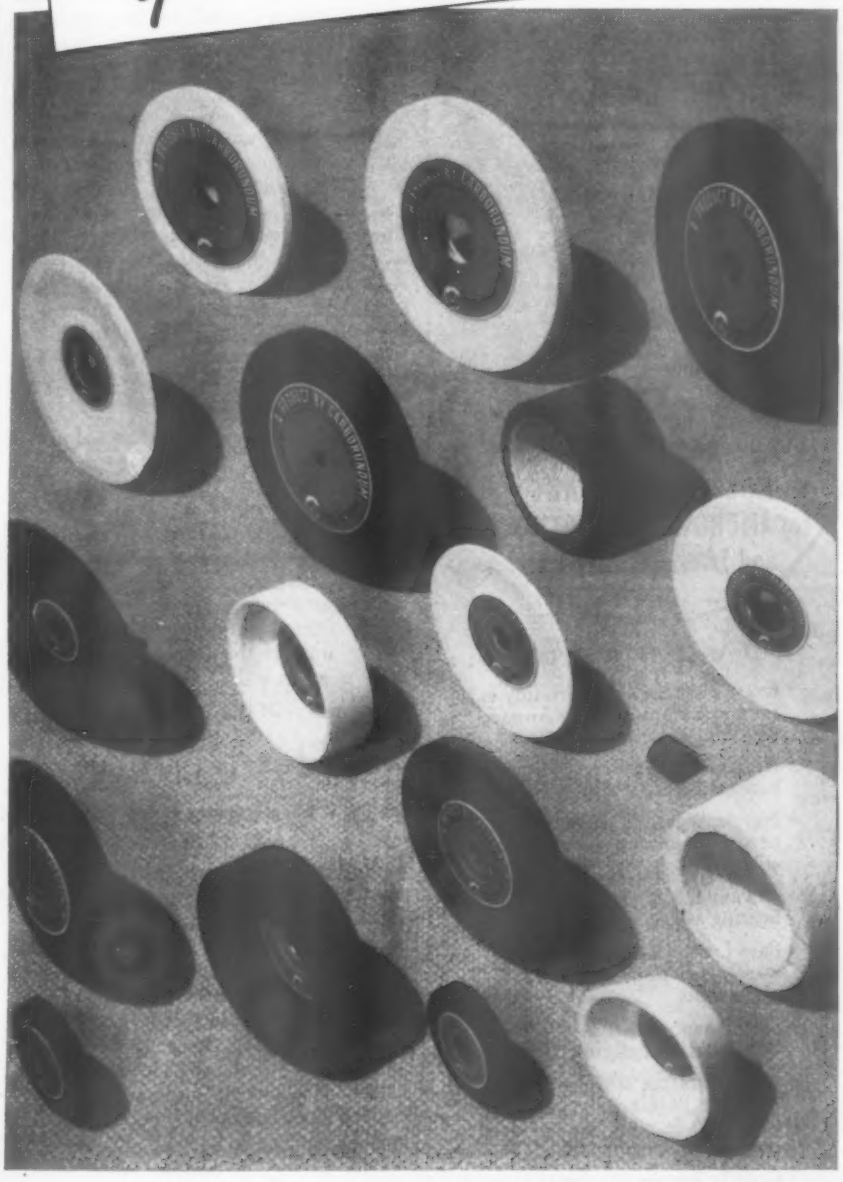
This book presents in one volume a broad study of materials and manufacturing processes employed by the design engineer, and provides information directly useful in the selection of materials for design. The section under materials includes a discussion of various metals, the effect which may be developed through heat treatment, corrosion, and information on magnetic and electrical properties of materials.

Processes discussed include casting, powder metallurgy, hot working, cold working, welding, machining, plating and finishing. Fifty pages are devoted to the casting process, and information is presented on sand casting, pattern design, casting design, permanent mold castings, die castings, centrifugal castings. The design of metal mold castings also is discussed.

An indication of the approach to the casting section is found in the introduction, which includes the following statement: "There is practically no limit to the size, shape, and alloy of the castings that may be made. Castings regularly produced range from tiny dental inlays of rare metals to complicated steel castings exceeding 200 tons in weight. With proper technique and a design which incorporates a full appreciation of the foundryman's problems, almost any article may be cast. Numerous items could be mentioned which would be impossible to produce by any other method. It is, of course, not true that casting always represents the best solution to the production problem, but the possibilities of the casting method are of such significance that it should not be overlooked for either new or revised designs."

Aluminum Co. of America, Cleveland, has received WPB approval for alterations to building and installation of furnace and handling equipment for processing scrap aluminum, to cost about $350,000.

How to take the Guesswork out of your Abrasive Problems!



ONE way is to specify wheels, coated abrasives, grain and "MX" products by "CARBORUNDUM." Each product is produced under rigid standards. Every ingredient is carefully controlled. Every manufacturing process is carefully checked by experienced engineers.

Of course, to select exactly the right abrasive for even the most difficult job, you can always obtain the help and advice of the "CARBORUNDUM" Abrasive Engineer. He's a man whose experience covers abrasives from "A" to "Z." The chances are a "CARBORUNDUM" representative can be a big help to you—he has been to many others.

The Carborundum Company, Niagara Falls, New York.

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TRADE MARK

FOR EVERY ABRASIVE APPLICATION

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VETERANS MAKE PRECISION CASTINGS

(*Concluded from page 85*)

to work for Ford at the conclusion of his training.

Originally, the primary objective of Ford's precision casting experiments was the salvaging of considerable quantities of high speed tool steel then being scrapped. These parts now provide the raw material from which new tools are being made. However, it is currently felt that the possibilities inherent in the process offer broad opportunities for effecting a substantial reduction in cost of producing other parts which are difficult and expensive to machine because of their extreme hardness, and the technique for casting such parts constantly is being developed.

In general, the Ford process corresponds to that commonly employed in making precision castings, although some variations have been adopted in certain of the operations. One of the latter is the use of plastic molds in forming the wax patterns. Plastic, rather than metal, was selected for two reasons—to enable disabled veterans to handle them with greater ease, and to reduce costs. On both scores the relatively light plastic molds are said to have been markedly successful, without lowering the quality of the patterns, although additional experiments are being conducted on their design and use.

Patterns are made by injecting hot wax into the molds. The machine used for this purpose, shown in Fig. 3, was designed by R. R. Rausch, general superintendent of the Rouge plant. Held at a temperature of 130 degrees Fahr., the wax is forced by the machine into the mold at a pressure of 90 pounds per square inch. This pressure insures wax penetration into small recesses. After cooling, the patterns are removed and, in the case of small cutting tools, are mounted with gate and runner in a cluster, the exact number depending on their size.

Various kinds of investment materials are being used to surround the wax patterns. One mixture frequently employed includes 80 mesh banding sand and 25 per cent 140 mesh silica flour. The binder used is tetraethyl orthosilicate. To eliminate voids in the investment the mold is vibrated thoroughly on a machine and then is allowed to dry for 24 hours. Finally, it is placed in an electric furnace where it is baked at a temperature of 1600 degrees Fahr. and the wax pattern is burned away.

Small electric arc melting furnaces of special Ford design are used to melt the casting metal. Raw material, as previously mentioned, is scrap tool steel which is melted in the main steel foundry and cast into round bars about 1 inch in diameter and 12 inches long. Metal temperature in pouring the castings varies with composition of the charge but for the cutting tools is about 2850 degrees Fahr.

WORKING WITH ALUMINUM?

Typical layout for die casting, showing compact 20 KW Ajax-Tama-Wyatt furnace in position. Unit comes with complete control cubicle, as shown.

INVESTIGATE THIS UNIQUE HOLDING FURNACE for IMPROVED OPERATIONS and LOWERED COSTS!

INDUCTION FURNACES MEAN A MODERN PLANT..

In addition to the holding furnace here described, small, compact, twin-coil melting furnaces are likewise available for continuous production.

Rolling mills and foundries using Ajax-Tama-Wyatt units have *consistently* developed the highest physical properties in their aluminum products . . . with decreased gas absorption, absence of all segregation, and elimination of oxide inclusions and hard spots . . .

Clean-cut temperature control, great ease and simplicity of handling are operating characteristics. Ajax induction furnaces give you a modern plant, a cooler foundry, a better product. Significantly, too, they have been known to pay for themselves within less than six months. *Write for latest TW catalogs describing both Ajax holding and melting furnaces for aluminum!*

ADVANTAGES

- Every element of uncertainty is removed from holding furnace procedure
- Automatic, positive temperature control to within 5 degrees
- No segregation, iron pickup, or contamination — automatic stirring
- Always ready to operate — no heating up or waiting periods
- Pays for itself quickly by doing away with pot or crucible replacements
- Maintenance costs so low as to be virtually negligible
- Low operating costs — only 12 KW for holding continuously up to 400 lb.; 8 KW when covered on week ends
- Greatly improved overall foundry conditions inherent in induction melting

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AJAX ENGINEERING CORPORATION • BOX 1418 • TRENTON 7 • N. J.
INDUCTION MELTING FURNACE

AJAX METAL COMPANY, Non-Ferrous Ingot Metals and Alloys for Foundry Use
AJAX ELECTROTHERMIC CORP., Ajax-Northrup High Frequency Induction Furnaces
AJAX ELECTRIC CO., INC., The Ajax-Wyatt Electric Salt Bath Furnace
AJAX ELECTRIC FURNACE CORP., Ajax-Wyatt Induction Furnaces for Melting
ASSOCIATE COMPANIES

New Society Formed By Spectrographers

The first meeting of the Detroit Spectrographer's Society was held Jan. 22, at the Rackham Memorial Building, Detroit with Jess Toth acting as temporary chairman. The newly formed society has for its purpose the dissemination of knowledge pertaining to spectro-chemical analyses and to assist in the development of improved methods and technique as it affects the science of spectroscopy as well as the related sciences of chemistry and electronics.

The following officers were elected: Chairman, William Edgar, Federal Mogul Corp., Detroit; vice chairman, Dean E. Shields, Packard Motor Car Co., Detroit; secretary, M. M. White, Harry W. Dietert Co., Detroit; and treasurer, E. A. Boettner, Wyandotte Chemical Corp., Wyandotte, Mich. Executive council includes R. E. Nusbaum, General Motors Research Laboratory; John Schuch, Harry W. Dietert Co.; and William Sundwick, Ternstedt Mfg. Division, of Detroit.

MATCHPLATES SAVE FOUNDRY TIME

(*Continued from page* 103)

will appear above the parting line.

With the fine disregard for consistency which seems to characterize foundry nomenclature a molder may employ any one of several terms in referring to the same object. A device on which the pattern is mounted in the drag is known as a rollover board, a followboard, an odd side or a match, irrespective of whether it is composed of wood, sand, clay, plaster, special compound, or metal.

Because of the light weight and the fact that patternmakers are accustomed to its use, wood is employed extensively. It may be shaped readily to almost any desired contour. Where the amount of carving and fitting might cost too much or where a wood patternmaker might not be available, the molder can make his own followboard from sand, clay, plaster, metal or one of the proprietary materials now on the market.

Make a Sand Match

A sand match may be used where only a comparatively small number of castings are required. In one method the pattern is placed on a flat board. Blocks corresponding in height to the part of the pattern to appear above the joint line are placed between the board and a cope which in this instance takes the place of the usual drag. The cope is filled with new sand and rammed hard. After the cope and board have been rolled over, the parting is made. This hard sand cope then is used as a foundation or follow board for the pattern or patterns in all subsequent drags.

In a variation of this method the cope, face up, is filled with sand and rammed hard. A suitable hollow is scooped in the sand and the pattern is rapped down into place and the joint made in the usual manner. Instead of a cope, any suitable rectangular frame nailed to a bottom board may be used.

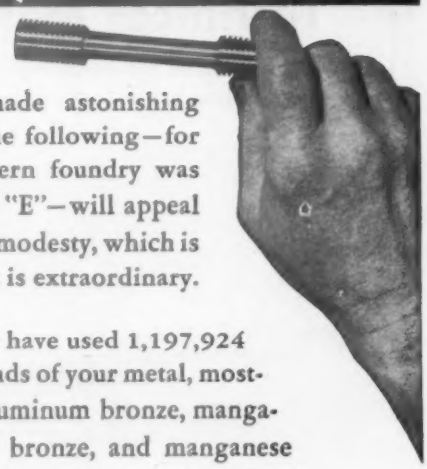
Where a more substantial follow board or sand match is required, one that will stand up in repeated use over a comparatively long period, the sand is mixed with linseed oil and a small amount of litharge, say a small handful for every two shovels of sand. The sand is dried and a sufficient amount of oil added to render the mass workable. Other core oils may be substituted for linseed. Some foundrymen prefer to add varying amounts of spent sandblast sand, or dust from the tumbling barrels to the new molding sand. This sand match will dry quite hard in about 24 hours when a final finishing touch may be given by applying a light coat of shellac.

Clay is used extensively for followboards, particularly where a considerable number of small irregular shaped patterns are attached to a gate. A wood frame 2 to 3 inches deep, depending on the depth of the patterns, and corresponding in inside dimensions to the flask to be used later, is nailed to a bottom board. The frame is soaked in or painted with linseed oil as a preservative. Fire clay moistened with water and a little oil is packed into the frame and scraped off flush with the upper edge. Suitable depressions are scooped in the face and the pattern is rapped down the required distance. The molder then uses small tools to shape the clay up or down to follow the parting line around the pattern.

Under certain conditions plaster of paris makes a highly satisfactory match or follow board. The pattern or patterns are rolled over or bedded in a drag filled with sand and an accurate parting surface is prepared in the usual manner. A suitable frame is placed on this drag and filled with the liquid plaster. In some instances a bottom board is screwed to the frame after the plaster has set. At other times the board is nailed on before the frame is placed on the drag. The plaster is poured through a hole in the board just as one might pour metal into a sand mold.

For small, plain jobs no reinforcement is necessary. On large or intricate jobs it may be necessary to incorporate wood blocks, nails, rods or pieces of pipe at

REJECTS BELOW 1/4 OF 1%!
A Highly Expert Foundryman reports to AJAX



Nonferrous founders have made astonishing records in the last 3 years. The following—for which this representative eastern foundry was thrice awarded the Army-Navy "E"—will appeal to all foundrymen because of its modesty, which is typical, though the achievement is extraordinary.

"We have used 1,197,924 pounds of your metal, mostly aluminum bronze, manganese bronze, and manganese aluminum bronze. All of this has gone into Army and Navy material. It has been subjected to severe tests, both chemical and physical, in castings weighing from ½ to 750 lb. each. A lot of this had to stand a hydrostatic test of 7,700 lb. On this production, we feel it safe to say that our rejects have been less than ¼ of 1% due first, to your fine quality of metal, and second, to our good luck."

We are always gratified to receive letters of this character, and take pleasure in placing it among many similar ones received during our 65 years in the metal business.

Send for booklet
"INGOT METALS OF TODAY"

16 STANDARD INGOT METALS BY AJAX
Ajax Tombasil
Ajax Plastic Bronze
Ajax Anti-Acid Bronze
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Ajax Nickel-Copper 50-50%
Ajax-Hamilton Gear Bronze
Ajax Manganese Copper
Ajax Aluminum Alloys
Ajax Phosphor Copper
Ajax Silicon Copper
Ajax Nickel Alloys
Ajax Phosphor Tin

NOTE
"Proper Melting Decreases Foundry Losses," contains interesting data. Also, the booklet, "Nonferrous Ingot Metals of Today." Write for both of these. They are free.

AJAX NON-FERROUS INGOT METALS AND ALLOYS FOR FOUNDRIES
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AJAX ENGINEERING CORP., Ajax-Tama-Wyatt Aluminum Melting Induction Furnaces
ASSOCIATE COMPANIES

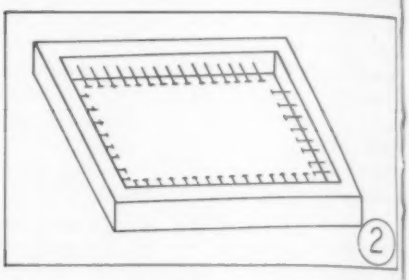
strategic points. These may be located in advance, or placed in the plaster mass while it is still in a liquid condition. A row of projecting nails as shown in Fig. 2 will anchor the plaster firmly in the frame.

Several proprietary substitutes for plaster also are available. On account of their greater strength, smoothness and freedom from shrinkage they find extensive application as follow board, matchplates, and master coreboxes.

A double face plaster or composition matchplate contains the replica of the drag part of the pattern on one side and the replica of the cope part on the opposite side. It is a combination followboard and pattern. A sand mold first is made in the usual manner. After the pattern is lifted out of the sand a shallow frame is placed on the drag and the cope is closed down as shown in Fig. 3. The liquid composition then is poured in and allowed to set.

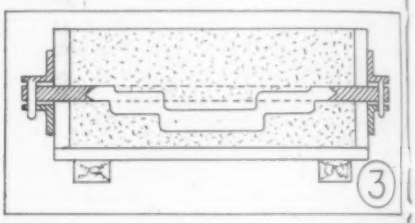
With one material recently introduced the pattern plate is ready for use in less than 2 hours, but the best results are secured by allowing the plate to dry thoroughly over night. The pattern requires no finishing and apparently is as hard and as smooth as glass. The manufacturer of this material supplies a master frame. Any number of duplicate plates may be made by inserting small inside frames held in place by a number of screws.

When using this type of pattern plate the molder first rams his drag either by hand or on a machine. Then plate and drag are rolled over and the cope is rammed on the side that is now on top. The cope is lifted, the plate with attached pattern is removed and the cope is closed down. Where the plate is made properly and there is no wabble in



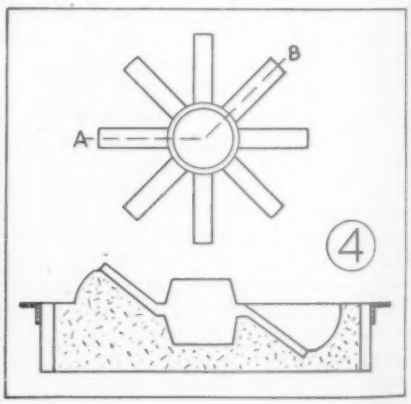
the pins on the flask, the cope and drag joints will fit together perfectly.

Sometimes on account of a deep draw or lift, or because a machine is available on which cope and drag may be rammed side by side—or where a greater production may be secured by having one man make the copes and another man make the drags—it becomes advisable to pro-



vide one followboard for the cope and a second followboard for the drag.

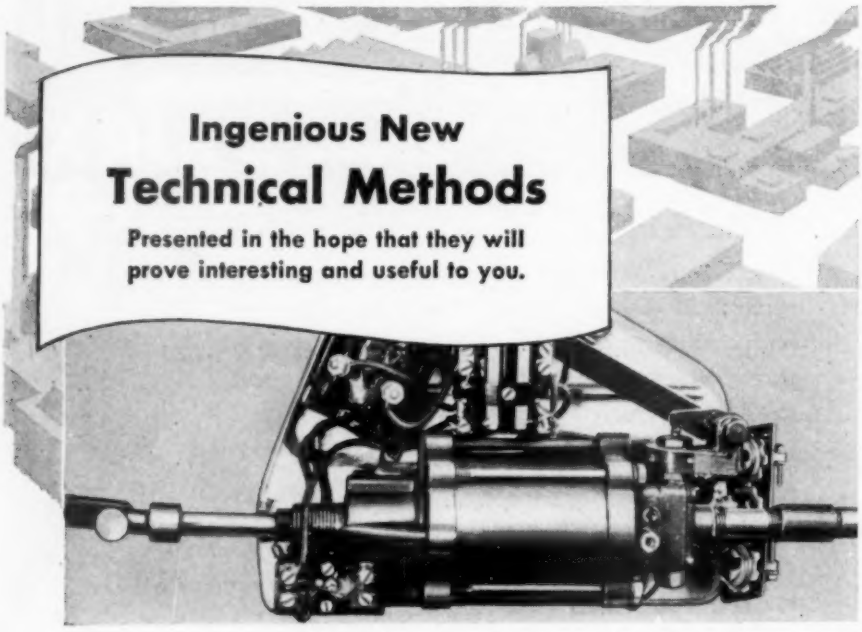
An instance of this kind is illustrated in Fig. 4, a small sheave spider in which alternate arms extend above and below the horizontal center line. Thus on this very irregular parting line the sand extends above the joint line of the drag under four arms, and extends a corre-



sponding distance below the flask line on the remaining four arms. Two plaster or other liquid composition follow boards will materially increase production of perfect castings.

A sand mold first is made in the usual manner and the parting made with a

(*Continued on page* 210)



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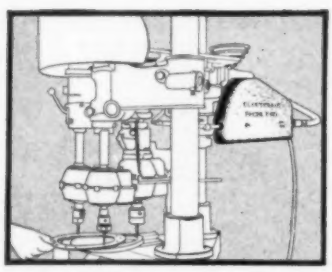
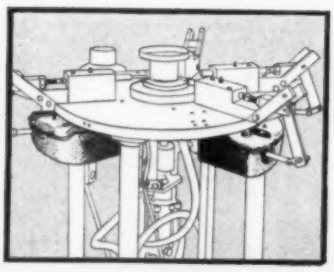
Present stockpiles of finest quality materials used in the manufacture of Wrigley's Spearmint chewing gum are now exhausted—necessitating discontinuance of production. When a supply of proven materials—known to be up to the finest standards of quality—is again available, Wrigley's will resume production—And Wrigley's Spearmint will be back to again help you on your job. In the meantime they are manufacturing a war brand. Wholesome but not excellent enough for the Wrigley brand name.

You can get complete information from Electrolin: Manufacturing Company, 1975 East 61st Street, Cleveland 3, Ohio



Set up to punch 3 holes simultaneously.



Shows holes being drilled automatically

Z-55

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NATIONAL NS SMELTING

(*Continued from page* 208)

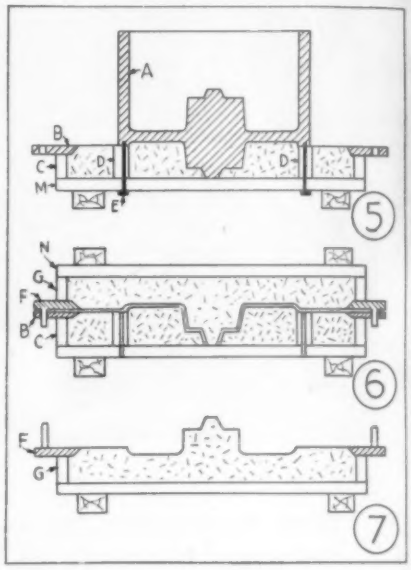
little more than the usual care. The cope is rammed, lifted off and set upon its back. Then a plaster or composition cast is taken of the drag face, and another cast taken of the cope face to serve as follow boards.

In the first instance the pattern is left in the drag. The exposed pattern surface is oiled to prevent the composition from sticking. A double frame is constructed with pins and guides corresponding accurate to the pins and guides on the original flask. The half frame with the pins is placed on the drag and filled with plaster or other material. After the plaster sets, the frame and plaster interior are removed from the drag and set aside to dry thoroughly. The spider pattern then is removed from the drag and placed in the cope. The half frame with the pin guides is placed on the cope and filled with plaster. Later it is removed and set away to dry thoroughly after which the plaster faces in both frames are shellacked.

When using this equipment later, the molder shifts the pattern from one to the other and rams cope and drag alternately. Since each part is rammed independently of the other, and since the cope is rolled over instead of being lifted from the drag, there is no danger of any sand getting pushed or knocked off.

Jobs of this kind rarely come out perfect the first time. Usually it is necessary to pour a preliminary casting in lead and note any discrepancies in the joint lines on the casting. Slight adjustments may be made by scraping the face of the joint here and there, or by a slight shift in the position of the guide pins.

Another material on the market for making followboards resembles molding sand and is manipulated like green sand. In a few hours it resembles hard fiber and requires no reinforcement. The manufacturer of this material also provides malleable iron pattern frames ½-inch thick provided with pins and pin holes. An undercut bevel overlaps the edges of the composition and binds it firmly to the plate or pattern board. The frame and board receive all the handling, rapping, etc., and protect the pattern from strain and abuse. Either wood or metal patterns may be mounted on this composition. It is not necessary to make a sand mold in preparing this followboard.



The three steps in the process are shown in Figs. 5, 6 and 7 The pattern *A* is placed cope side down on the board *M*. Suitable blocks *D* are placed under the outer edge. The malleable iron frame *B* then is adjusted on blocks or frame *C* to bring the upper edge flush with the bottom edge of the pattern. Care is taken to see that the pattern is truly perpendicular to the frame to insure a perfect draw from the mold later. Bolts *E* extend up through holes in the bottom board and enter tapped and threaded holes in the pattern *A*. The space inside the frame and under the pattern is packed with the composition and a flat parting is slicked between the frame and the pattern. The bolts then are loosened and the pattern is lifted away temporarily. The board with the superimposed compound is allowed to stand for a few hours until the composition has hardened.

The second step in the process is shown in Fig. 6. Here the second iron

(*Concluded on page* 212)

USERS COME BACK FOR MORE!

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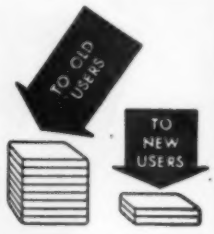

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Economical: These J-M plates combine low initial price, low handling costs and long life.

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(*Concluded from page* 210)

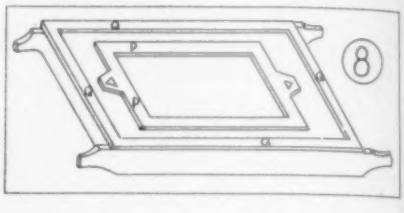
frame *F* is placed on the first frame *B*. A shallow wood frame *G* is placed on the iron frame and packed full of the compound as in ramming an ordinary sand cope. The upper surface is strickled flat and the board *N* is nailed or screwed in place. This cope then is lifted off and turned over when it will appear as in Fig. 7.

The pattern *A* then is again bolted in place on the first board *M* and is ready for use in ramming the drags. The copes are rammed on the followboard *N*.

Metal matchplates are made according to one of two main methods. In the first the patterns are soldered, brazed, bolted or riveted to a flat aluminum or steel plate. In the second, castings and plate are cast as a unit. In both cases the original or master patterns are given double shrinkage allowance.

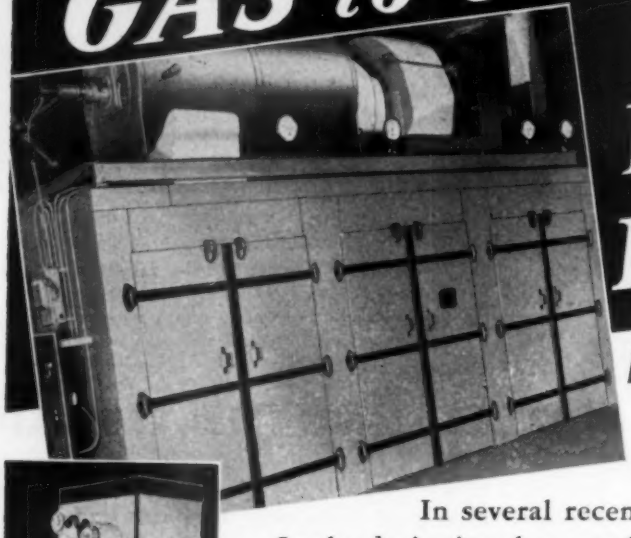
In making a double-face metal matchplate a flask is selected from 6 to 8 inches wider and longer than the proposed matchplate casting. The patterns are arranged in their proper positions and either bedded in or rolled over in the drag. The parting is made carefully and accurately and then a cope is rammed and lifted off. The gate may be cut with a gate cutter or formed with a piece of wood and may be either in the drag or the cope depending on several factors which need not be considered at present.

A rectangular frame *P*, Fig. 8, outside dimensions the same as those of the proposed matchplate, is laid on the flat face of the drag. This thin wood frame is the thickness of the matchplate, that is, ⅜ to ⅝-inch. Narrow strips of wood *Q* the same thickness as the frame are laid on the edges of the flask and tacked in place. The space between the strips and the frame then is filled with sand,

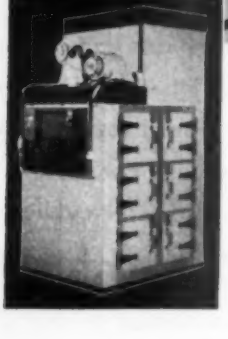


pressed down and slicked flush. The frame *P* then is removed, but the strips are left on the flask edges. Obviously, when the cope is closed down, the former adjoining faces of cope and drag will be separated by the thickness of the strips on the joint and the resulting matchplate casting will be a plate ⅜ to ⅝-inch thick with the patterns above and below directly in line with each other. Proper precaution is taken to see that the guide pins on the flask are absolutely accurate without any shift or wabble.

GAS to OIL — OR VICE-VERSA



A MATTER of MINUTES!



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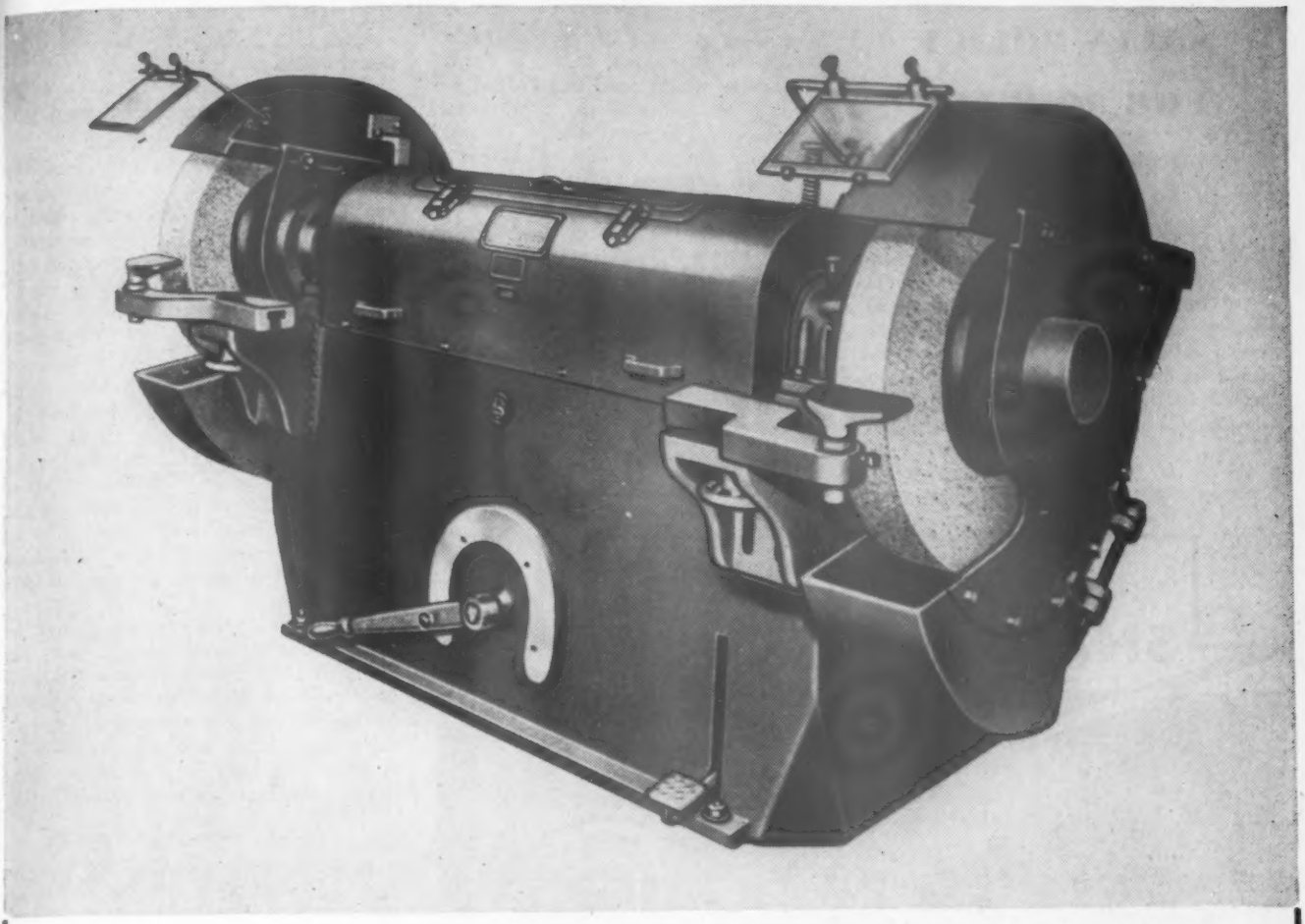
Reorganizes Export Division

Gardner-Denver Co., Quincy, Ill., has established the main office of its export department in the Woolworth building, New York, under the direction of G. V. Leece, vice president, who will have charge of the entire export division. S. T. Brown, formerly in the company's Denver plant, has been appointed assistant manager, and Harold Weber, who has been associated previously with the New York office of the company, has been appointed assistant sales manager of the new export office. Edward Church has joined the Denver office, in the export division, and C. E. Kaiser has been put in charge of the export division in Quincy.

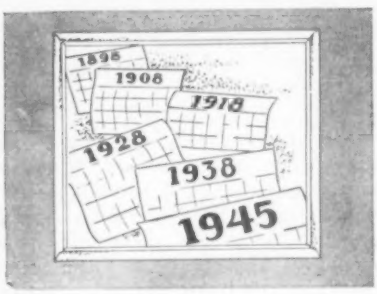
Book Review

Metals and Alloys Dictionary, by M. Merlub-Sobel, cloth, 238 pages 5⅜ x 8½ inches, published by Chemical Publishing Co. Inc., Brooklyn, N. Y. Price $4.50.

This book, reported to contain over 10,000 useful metallurgical terms, is designed for the reference library. It is not limited to definitions of metallurgical terms, since it presents compositions, properties and uses of many of the important commercial alloys. In addition physical constants and properties of the chemical elements are given as well as descriptions of equipment and processes used in modern metallurgy and other pertinent information.



LET THE EXPERIENCE OF MANY YESTERDAYS



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THE United States ELECTRICAL TOOL CO.
CINCINNATI 14, OHIO

SALES POLICY FOR JOBBING FOUNDRIES

(*Continued from page* 90)

The management of any foundry cannot, of course, produce any real profit until it has first returned to the stockholders an amount equal to that which could be secured by placing the same funds in investments which are not subjected to the hazards of manufacturing governed by intense competition.

Applying this principle to the $1,028,000 of total investment shown in Fig. 3, the foundry would need to earn $51,400 per year to realize 5 per cent normal interest on the invested capital, before a real profit from operations would begin. The use of 5 per cent normal interest in this example is for illustration of a principle and is not to be used by any foundryman unless it represents a fair going rate obtainable.

Further, assuming that the foundry thinks it can operate in the market and still pay its investors for the risk of their invested capital, a business risk profit of an additional 5 per cent on the total investment is provided. This would also amount to $51,400 per year or an additional $4283 per month.

The budgeted profit would be $8568 per month which should be used as a profit goal.

After establishing a profit goal the several commitments for production are analyzed and the results summarized to produce the $12,700 of manufacturing profit. From this is deducted the selling and administration costs, leaving an anticipated net profit of $3300, or $5266 short of realizing the established profit goal.

Any one, or a combination of the following reasons may contribute to failure of the net profit to equal the established goal: 1. Competitive selling prices below cost; 2. Insufficient business booked for normal operation of the foundry; 3. Excessive costs caused by inefficient operations and/or too much management overhead for normal operations.

Competitive selling prices cannot be helped, but the individual foundry can establish a cost system so sound in principle and practice that with sufficient courage of conviction it will accept only such business as will be profitable or at least will help carry fixed overhead under subnormal operating conditions.

Major Cause for Concern

Insufficient business booked for normal operation of the foundry will undoubtedly be a major cause for concern in the first months after the war. Therefore, the sensible foundryman will take all the necessary steps to insure against accepting business below the cost of metal, direct labor and such items of overhead that would be increased by the actual production of the castings.

Excessive costs caused by inefficient operations and too much management overhead for normal operations can be determined only by analysis of actual conditions and the proper adjustments made.

Through the medium of a series of articles appearing in THE FOUNDRY the author has explained the principles of sound and sensible cost accounting accompanied by forms and procedures showing how to apply the principles in securing dependable costs of individual castings.

Assuming that the reader has read these articles, it seems unnecessary at this time to review them. However, it might be helpful to the foundry executive to explain a method of using the estimated costs of producing, selling and executive administration in establishing a profitable sales policy. In other words, to tell him when and why to take an order and when and why to refuse it.

Let us now consider three separate types of competition which will be met in the postwar period:

Case No. 1—Competitive selling price at approximate ceiling.

Case No. 2—Competitive selling price under ceiling.

(*Continued on page* 216)

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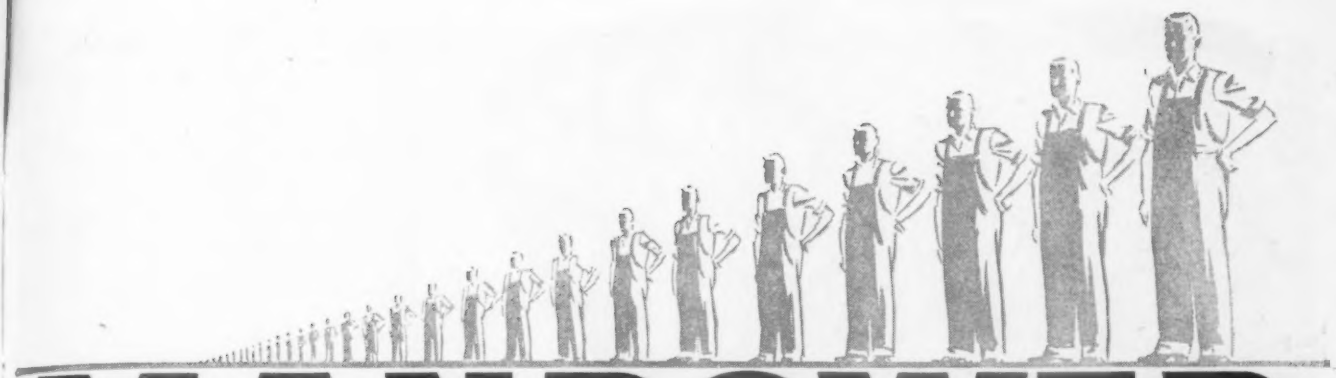

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In war plants and general industries throughout the nation, dust and fume control systems planned, designed, and installed by Kirk & Blum have aided materially in maintaining top production by reducing absenteeism.

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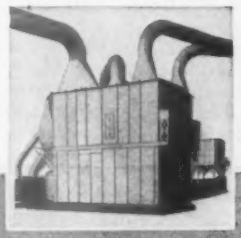

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(*Continued from page* 214)

Case No. 3—Keen competition — hungry for business.

To illustrate the method of establishing the sales policy, let us use the "Individual Job Cost Estimates," as shown in the table "Case No. 1" on page 90.

It has been explained previously how a profit goal is established. Applying the same principle to this job, measuring the investment utilized for it and, calculating at 5 per cent per annum, the normal interest profit is $72.33, and an equal amount is provided for stockholders' risk profit.

This is an ideal type of business which should be sought by the foundry, as it recovers a 5 per cent normal interest on invested capital and an additional 5 per cent for the risk of invested capital, and would also aim to build up a reserve as indicated by the $124.71 of extra "Marketing Profit." This would be the case if the sale were made at the ceiling price of $1700, when the estimated cost amounted to $1430.63 and would result in a total profit of $269.37.

Suppose a competing company enters the market with a price of $1300 on the same job, which would be $400 less than the established ceiling and $275.29 under the estimated price of $1575.29 (shown in estimate No. 1). By using this scientific analysis chart, the foundryman is now in a position to ascertain what concessions should be made in case he is interested in bidding on this type of borderline business.

List Alternative Concessions

The figures shown in the table "Case No. 2" illustrate the concessions that must be made to meet the competitive price of $1300. They are:

1. $72.33 provided for "Business Risk."
2. $72.33 normal interest on investment.
3. $44.28 of chargeable executive administration.
4. $55.35 of chargeable selling cost.
5. $8 fixed cleaning overhead.
6. $23, or 23 per cent of the molding fixed overhead.

Since the concessions of $275.29 will not include any out-of-pocket money for metal, direct labor or other operating expenses incurred because of the addition of this business, and since the foundry is operating below the established normal, there is justification in accepting the business. However, if the foundry were operating at normal it would be good sales policy to refuse the business.

When operating below normal, many foundrymen will be so anxious to secure business that they will bid far below the ceiling prices established by law.

This puts the foundryman "on the spot," for without a dependable cost system that will allow him to analyze the situation accurately and carefully, he may ignorantly commit the company to sales contracts that would not only pass

(*Concluded on page* 218)

Be Safe

The composition of much of today's industrial Aluminum Scrap makes it unsuitable for the direct production of sound castings. Foundries which have attempted to use this scrap, instead of ingot, have experienced serious trouble and loss of man-hours in the attempt.

There is no "treatment", or flux, which can possibly provide an easy way out so that satisfactory castings may be produced directly from such scrap. All the experience, skill and equipment of a modern smelter is required for the blending and re-constitution of the alloys to make them suitable for foundry use.

The apparent small saving in metal cost by the purchase of scrap of varying quality as against ingot of known quality, is frequently wasted many times over in poor castings — Rejects mean wasted man-power and time which all adds up to higher casting cost.

Foundries can insure themselves against this waste and excess cost by purchasing specification aluminum ingot of uniform, known quality from experienced, qualified smelters.

The American Metal Company, Limited
New York City 6

Apex Smelting Co.
Chicago 12, Illinois

Berg Metals Corporation
Los Angeles 11, California

The Cleveland Electro Metals Co.
Cleveland 13, Ohio

R. Lavin & Sons, Inc.
Chicago 23, Illinois

Federated Metals Division
American Smelting and Refining Company
New York City 5 and Branches

General Smelting Company
Philadelphia 34, Pennsylvania

Samuel Greenfield Co., Inc.
Buffalo 12, New York

William F. Jobbins, Inc.
Aurora, Illinois

The National Smelting Company
Cleveland 5, Ohio

Niagara Falls Smelting & Refining Corp.
Buffalo 17, New York

Sonken-Galamba Corporation
Kansas City 18, Kansas

U. S. Reduction Co.
East Chicago, Indiana

Aluminum and Magnesium, Inc.
Sandusky, Ohio

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111 West Washington Street, Chicago 2, Illinois

An O.K. from

Every Foundry using SHELTON *Metallic* FILLER

Does the job better — saves time and castings because it

★ SETS FASTER

★ DRIES TO GREATER DEGREE OF HARDNESS

Use Shelton Filler in your Foundry

SEND FOR Free Sample

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AMERICAN CRUCIBLE CO.

SHELTON, CONN.

CHECK BLOWERS AND EXHAUST SYSTEMS *Instantly* with the *Alnor* Velometer

This instantaneous direct reading air velocity meter measures air speed in feet per minute. There are no calculations, no timing, no conversion tables; its use is so simple that anyone can take accurate measurements with the Velometer. Extension jets permit correct readings in many locations that would be difficult or impossible to reach with other means of measurement.

Keep exhaust equipment working efficiently by regular checks for draft, leaks, blower operations, etc., with the Alnor Velometer. You can get accurate information on performance with a few minutes' inspection at regular intervals.

The Velometer is made in several standard ranges from 20 fpm to 6000 fpm and up to 3 inches static or total pressure. Special ranges available as low as 10 fpm and up to 25000 fpm velocity and 20 inches pressure. Write for Velometer bulletins.

ILLINOIS TESTING LABORATORIES, INC.

420 NORTH LA SALLE STREET

CHICAGO 10, ILLINOIS

(*Concluded from page* 216)

along to the customer all the profit and fixed expenses, but some of the out-of-pocket money as well.

The figures shown in Case No. 3 illustrate how to determine a sales policy that will tell the foundryman whether he should meet a competitor's bid of $1000.

We assume that the competitor, either by pure guesswork, or by computing his estimated sales prices by means of ineffective casting methods, thinks the price of $1000 will recover all out-of-pocket money and some additional money to help pay for fixed expense.

It will be noted that the $575.29 difference between the original estimated sales price of $1575.29 (shown in case No. 1) and the competitor's bid of $1000 concedes all profit, executive administrative and selling charges, allowances for scrap returns, fixed overhead for producing, and $66 or 27½ per cent of the molding variable overhead.

Under most conditions, the foundryman must refuse to accept the job. However, should he desire to take the job at a loss of actual dollars spent for supplies not recovered in the sales price, in the hope that he might secure other profitable jobs as a consequence, he would do so with a full knowledge of exactly what he is doing and might well charge the loss to some promotional account.

Book Review

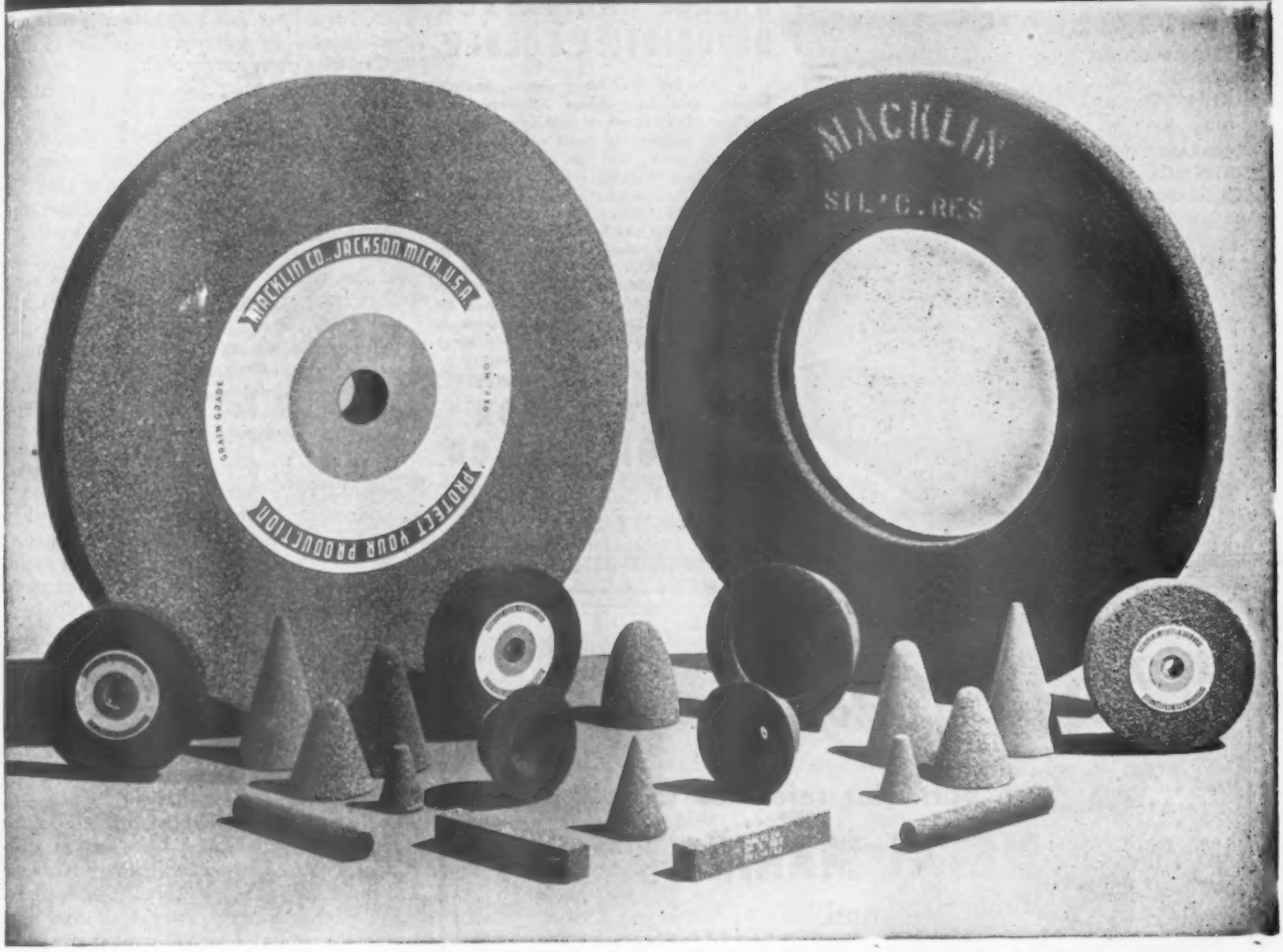
Sheet Metal Theory and Practice, by John C. Butler, cloth, 173 pages, published by John Wiley & Sons Inc., New York. Price $3.

Designed for a training course to supply trained workers in the sheet metal shop of a large West Coast Navy Yard, the book has fulfilled its primary object since the author states that the shop in question was enabled to meet its schedules on time and the work performed by the trainees compared very favorably with that done by experienced employees. Although it deals specifically with marine sheet metal work, the material presented is applicable to all branches of sheet metal work.

The book is divided into 13 chapters in addition to the introduction which discusses safety regulations, shop and work organization. The chapters relate to such phases as tools and machines, welded assembly, riveted assembly, soldering and fluxes, seams and locks, ship terms and labelling, blueprint reading, measuring and use of paper patterns, material allowances, ventilation and heating, furniture and similar materials, materials, and shop practice.

Cooper-Bessemer Corp., Mount Vernon, O., has been awarded a fifth additional gold star by the United States Maritime Commission to be added to the company's "M" pennant, in recognition of continued outstanding war production. The company also holds the Army-Navy "E."

MACKLIN GRINDING WHEELS



FOUNDRIES, large and small, require grinding wheels in many sizes, shapes, grains and grade combinations.

Macklin Company is thoroughly equipped to produce high quality grinding wheels for all foundry requirements.

No matter what your grinding problems may be there is a Macklin wheel to fit the job that will "Protect Your Production."

Ask for the services of a Macklin Field Engineer.

Invest in War Bonds

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NEW and UNIQUE! » THE CARTRIDGE BENCH CORE BLOWER

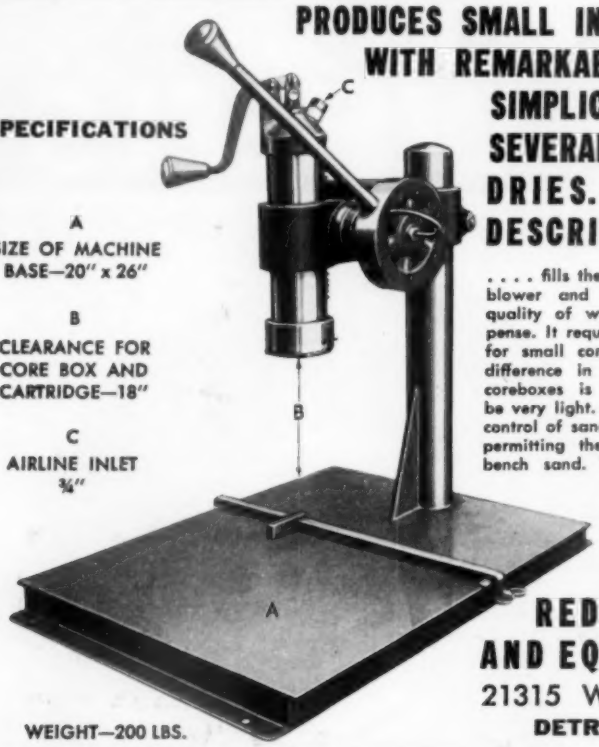
PRODUCES SMALL INTRICATE CORES WITH REMARKABLE SPEED AND SIMPLICITY. IN USE IN SEVERAL LEADING FOUNDRIES. WRITE FOR DESCRIPTIVE FOLDER.

SPECIFICATIONS

A
SIZE OF MACHINE BASE—20" x 26"

B
CLEARANCE FOR CORE BOX AND CARTRIDGE—18"

C
AIRLINE INLET ¾"



WEIGHT—200 LBS.

. . . . fills the need for a simple, flexible blower and has raised quantity and quality of work at a minimum of expense. It requires no large volume of air for small cores and no adjustment for difference in height, size or shape of coreboxes is necessary. Coreboxes can be very light. The need for strict moisture control of sand has been greatly reduced, permitting the use of almost any core bench sand. Thus by eliminating sand trouble the quality of intricate work that may be done with the machine is greater than by any other method of blowing.

(Patents Pending)

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DETROIT 19, MICH.

Consulting Service

with particular reference to

METAL MAKING

and

FOUNDRY OPERATING PROBLEMS

STEEL • MALLEABLE
GRAY IRON
NON-FERROUS

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PRACTICAL FOUNDRY ENGINEERS
4040 BOARD OF TRADE BLDG. — PHONE WABASH 3550
141 WEST JACKSON BLVD. • CHICAGO (4), ILL.

MECHANIZATION OF GRAY IRON FOUNDRIES

(*Continued from page* 98)

4. For intermittent operation involving extensive storage of molds, more careful planning is necessary in estimating the cost of equipment and the returns on the investment, for, strange as it may seem, the cost of mold storage and handling equipment for batch operations will often exceed the cost of continuous power conveyors.

5. In planning continuous operation, it is of course essential to balance melting capacity and mold production, along with core room and cleaning room operations. Experience indicates that 2½ to 3 tons per hour melt is about the minimum tonnage to be considered for continuous cupola operation.

Increase in production through a sand handling and mold handling system will be from 50 to 200% depending on conditions before using mechanical equipment, type of work produced, volume of work produced and supervision.

System In Small Shop

It has been suggested that someone should have been able to work out a continuous molding system for a shop making light-section jobbing work, that would accommodate eight or ten molders, and would still be made to carry its own way; in other words, justify itself from an investment standpoint. The question is asked what would be the expense of installing such equipment; what could be expected in the matter of production on ordinary work; what would be the approximate maintenance cost and the possible benefits to be derived from this installation?

Let us recall that we are discussing equipment for small light-section castings, most of which will likely be made from match plate patterns in snap flasks on power squeeze machines, and that the average metal requirement per mold will probably be between 15 and 25 pounds each, with gates and sprue—say, 20 pounds for an average. A fair average for mold production is 30 molds per hour per machine. This is a little high for short-run work with frequent pattern changes, and somewhat low for repetitive work on power mold conveyor jobs.

A 10-molder line, producing 30 molds per hour per machine, with 20 pounds metal in each mold, requires 6000 pounds or 3 tons melt per hour, which is just enough to permit continuous melting. Such a line is nearly always supplemented with some floor work, to take care of cold iron and variations in melting.

Now then, experience has shown many times that in planning equipment for, say a 10-molder line, the following facts always come to light. The severe serv-

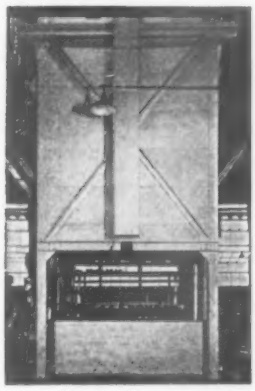
(*Continued on page* 222)

Carl-Mayer CORE AND MOLD OVENS

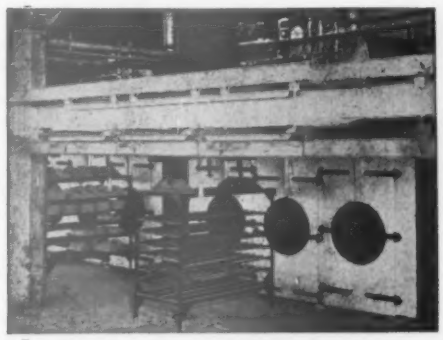
ALL TYPES . . . ALL SIZES

SERVING INDUSTRY OVER A QUARTER CENTURY

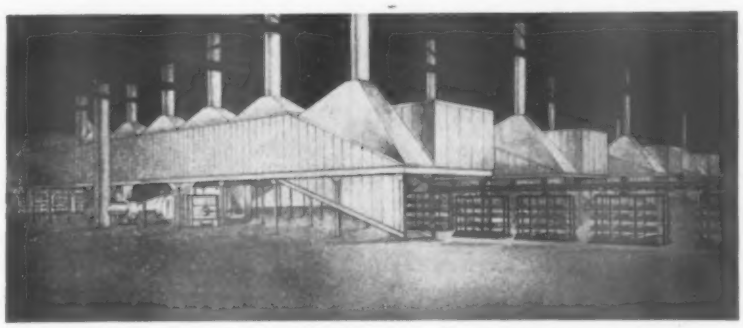
3 Outstanding Carl Mayer Vertical Ovens at General Steel Castings Corp. Each oven 67' high, 80 tons per bake, per oven.



Typical Carl Mayer Vertical Core Oven as installed at outstanding foundries.

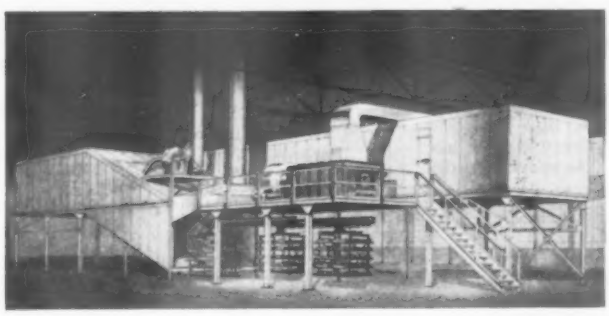


Part of large Carl Mayer Recirculating Gas Fired Rack Type Oven installation at The General Electric Co.

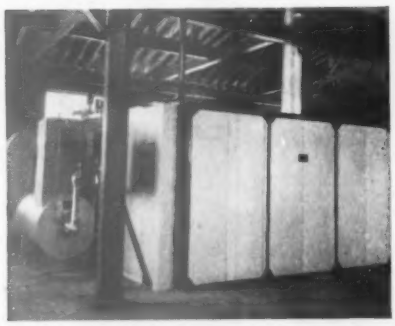


4 of the largest Continuous Monorail Core Ovens in U.S.A. for Ford Motor Co. each 170' long.

Rolling Drawer Oven Recirculating type. Fired with any fuel.



3rd Continuous Monorail Core Oven for Eclipse Aviation, Bendix Aviation Corp. 27' wide, 78' long, load capacity of 10½ tons per bake.



Car Type Mold or Core Oven with lift door as installed at Ford Motor, General Steel Castings, U. S. Steel Corp.

THE CARL MAYER CORPORATION • **3030 Euclid Ave., Cleveland, Ohio**

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Eclipse Aviation Division of Bendix Aviation Corp.
Electric Autolite Co.
Ford Motor Co.
Fort Pitt Steel Casting Co.
Frank Foundries Corp.
Fremont Foundry Co.
G & C Foundry Co.
General Motors Corp.
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Gilbert & Barker Mfg. Co.
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LOCATION is a most important factor in choosing your SUPPLIER of ALUMINUM INGOTS.

OUR LOCATION is very ADVANTAGEOUS. Try it.

THE CLEVELAND ELECTRO METALS CO.

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MEMBER—ALUMINUM RESEARCH INSTITUTE

THE use of worm gear speed reduction in Reading Electric Hoists allows you to fit the hoist to your plant layout subject to local conditions of clearance, space available, etc. These hoists are composed of four interchangeable units—suspension unit, hoisting unit, motor unit and control unit. Under this Reading Unit Construction Plan, 144 different combinations of these units are available to give you special equipment at the low cost of standard parts.

Other advantages of this worm gear construction are: quiet operation, compact size, and low cost of maintenance because of only three moving units in the hoisting mechanism.

It will pay you to investigate the money saving features of Reading Electric Hoists. For full technical information, write for Bulletin 1004.

READING CHAIN & BLOCK CORPORATION
2131 ADAMS ST., READING, PA.

CHAIN HOISTS • ELECTRIC HOISTS • OVERHEAD TRAVELING CRANES

READING HOISTS

(*Continued from page* 220)

ice in handling and preparing foundry sand requires a certain ruggedness and durability in machinery, that precludes the use of light fragile parts. Whether you require the handling of 5 or 100 tons of sand per hour, machine parts must be durable to withstand the abrasion and the wear and tear of foundry conditions. It is substantially true that a unit to handle 10 tons of sand per hour should not be designed and made any cheaper than a unit to handle 25 tons per hour.

Our 10-molder line producing 300 molds per hour will use approximately 15 tons per hour of prepared sand, figuring about 1 cubic foot of sand per mold. Therefore, it is immediately apparent that a sand preparation unit and distributing line for 14 to 16 molders will cost very little more than for a 10-molder line. That is really the explanation of why we do not see more of the small installations.

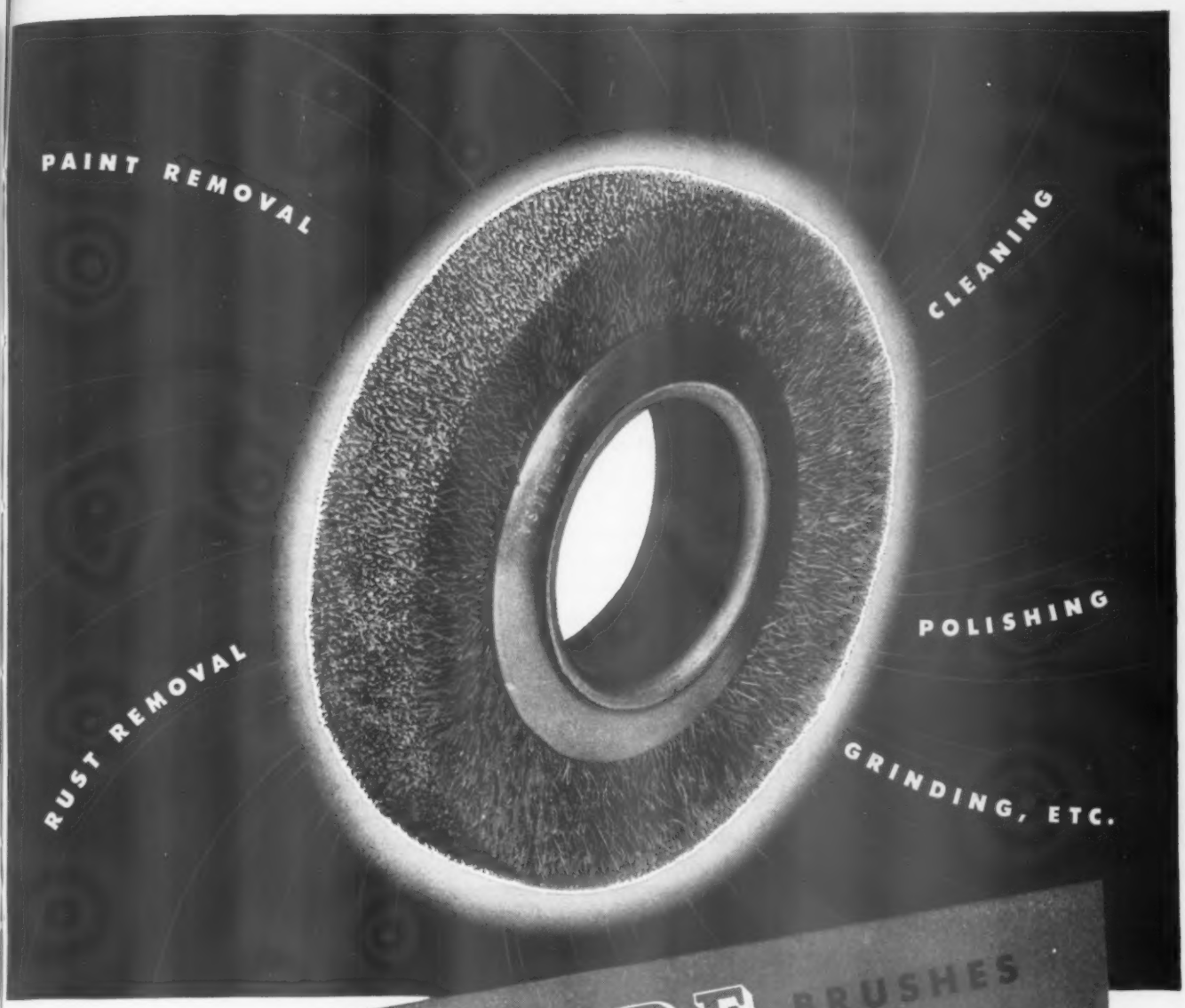
In making a check of the number of more or less typical installations, it is found that the cost of the equipment, erected, ready for operation, will range from $2500 to as high as $5000 per molding machine served.

Equipment Cuts Costs

The advantages of such handling systems effect a saving in practically every operation in the foundry. The molder is relieved of carrying his completed mold and setting it on the floor, and instead merely shifts it from the molding machine to a mold conveyor set at a convenient height. He is relieved of shoveling sand, by receiving uniformly prepared sand from a hopper which discharges directly to his flask. Production of from 25 to as high as 100 molds per hour, is obtained from each molding machine, and fatigue of the molder is reduced to a minimum.

Flexibility in location and arrangement of prepared sand hoppers can be obtained so as to change the type of molding machine used, to take care of changing conditions. Weight and jacket shifting is simplified. Pouring is centralized, and hand pouring can be done away with both in continuous and intermittent foundries by the use of simple overhead carriers arranged for rapid adjustment to the height of the molds. As a result, pouring ceases to be a back-breaking task. Shaking out is centralized, all castings being delivered at one point, making transportation to cleaning room a simple operation for trucks, cranes or conveyors. Gates and sprues can be removed easily from the castings at this point, combining this operation with that of shaking out, and eliminating any rehandling of this material. The sand, before being returned to the molder, is given a more thorough treatment than is possible with any floor method, and absolute sand control can be maintained, assuring uniform results. New sand requirements can be kept to a minimum, and in most cases the use of special fac-

(*Continued on page* 224)



Thor WIRE BRUSHES

In Popular Sizes

FOR ALL TOUGH JOBS

Sturdy, long life Thor wire brushes can be had in sizes from 4″ to 12″ outside diameter. Brush sections are heavily filled with doubly durable crimped wire in gauges of 30 to 36. Scientifically constructed, these modern brushes will operate efficiently at speeds of 2000 to 6000 r.p.m. depending upon the type of job to be done. See your nearby Thor distributor for industrial wire brushes for tough jobs.

Thor PORTABLE *Electric* TOOLS

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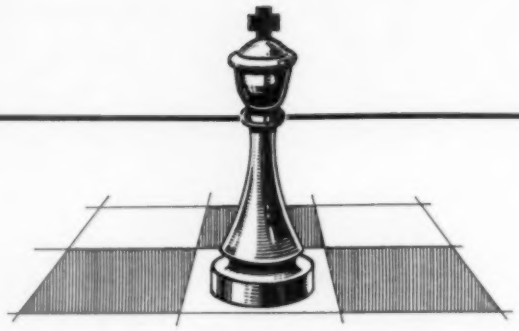

To check the king, all approaches must be analyzed

Far-sighted analysis holds as true in building as it does in chess. In planning a modern foundry or an addition to an existing structure, many moves must be considered: design, heat, light, ventilation, arrangement of stairs, elevators, stock rooms, wash rooms, etc.; layouts and location of equipment, inter-departmental movement of raw and unfinished materials. When these details are worked out in advance, considerable time and money is saved; moreover, the plant owner is assured of more efficient operation. Our experience as foundry engineers is at your disposal; case histories are also available.

A. A. WICKLAND & COMPANY
Engineering Bldg., Chicago 6, Illinois

FOUNDRY ENGINEERING SPECIALISTS

1905 **Strand** 1945
FLEXIBLE SHAFTS

SWIVEL BENCH TYPE MWH

FLEXIBLE SHAFTS AND MACHINES
ONE HUNDRED TWENTY-FIVE TYPES
LARGEST EXCLUSIVE BUILDERS

VERTICAL THREE SPEEDS

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FLOOR TYPES SWIVEL YOKE MOUNTINGS

Hand Cut
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Rotary Files and
Ground Cutters

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5001-5009 No. Wolcott Ave. • Chicago 40, Ill.

(*Continued from page 222*)

ing is eliminated. The arrangement of molders makes easy delivery of cores possible, and in many cases this can be done mechanically.

In addition to this, there are many less tangible items, such as cleanliness, better dust control and better all-around working conditions, as well as a saving in flask and molding equipment, and value of floor space, multiplied in accordance with the increase in production. This effects a saving through lower taxes, insurance, maintenance and depreciation of buildings per ton of castings produced. The steady flow of material and products benefits cleaning room, machine shops, and all finishing departments.

Maintenance, power, interest, depreciation and operation service for typical installations will average from $0.75 to $1.50 per ton of castings produced based on 300 working days per year, single shift.

From 150 to 200 tons of material is handled or rehandled in the average foundry to produce one ton of good castings. Mold handling represents 20 to 40 per cent of total material handling effort in the average foundry.

List Many Advantages

The advantages related here are general for a foundry with continuous pouring of metal. In continuous melting we have the choice of either making the molds and setting them to be poured on gravity roll conveyors or on the floor or of using a power driven mold conveyor setup. Let us briefly compare the advantages and disadvantages of these two systems—the power mold conveyor vs. the gravity roll conveyor. As far as the sand preparation plant and distributing system are concerned there is very little difference between the two conveyors.

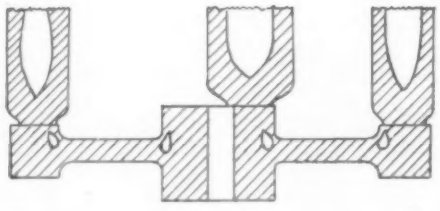
In a gravity roll conveyor system, say for 14 squeezer molding station, finished molds are placed on the conveyor by the molder and are poured on the conveyors through the use of pouring cranes and overhead pouring ladles. In continuous melting it is good practice to use gravity roll conveyors that will allow at least one hour's storage capacity. In intermittent pouring or where long cooling times are encountered, more storage is needed. The poured molds are then rolled onto a transfer car and taken to a centrally located vibrating shakeout screen and are shaken out, the bottom boards are returned to the proper station on the transfer car and the castings are picked off the vibrating shakeout screen, sprued and taken to the finishing room. The sand is then transferred by conveyor and elevator to the sand preparation plant to be reconditioned and used again.

Variations in the shakeout arrangement can be used. One scheme would be to shake the molds out on a grating at the end of the pouring zone of the gravity roll conveyors. A belt would run under the grating and take the sand

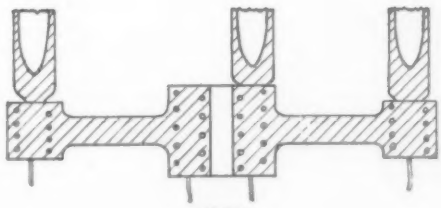
(*Continued on page 226*)

E-l-i-m-i-n-a-t-e shrink holes

McCormick Chill Coils make sound castings

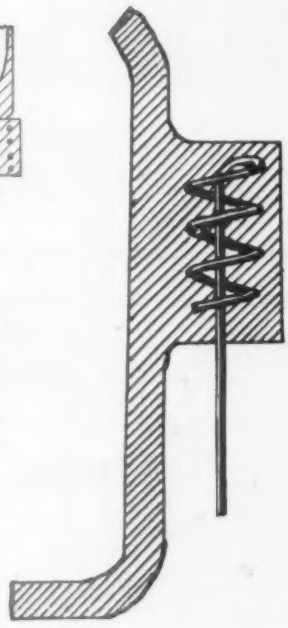


"A"



"B"

"A" shows location of shrink holes in a gear blank. Placing McCormick Chill Coils as shown in "B" eliminates internal shrinks. AND—the size of heads is reduced 50%.



This shows Coil used on a lug that is very hard to get solid.

Chill Coils are manufactured by us under U. S. Patent No. 1819765.

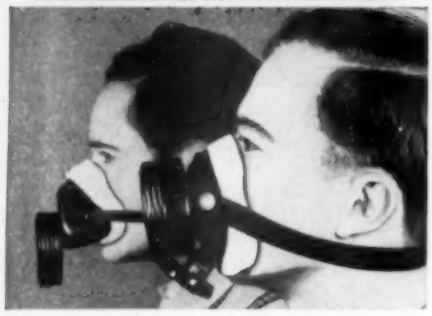
Write for Bulletin W-2 for further Chill Coil details.

J. S. McCORMICK CO.
PITTSBURGH, PA.

SIMPLE

WILLSON No. 5 and 45 Lightweight Respirators with easily replaceable filters protect workers. They remove harmful dusts and mists. Bureau of Mines Approvals for various hazards. Filters tested for low breathing resistance.

SAFE



Two sizes for wide range of faces assure safety of a good fit. Form molded rubber facepiece prevents leakage at edges. Adjustable headband and nose spring maintain tight seal.

COMFORTABLE

Comfort features of WILLSON Respirators make them easy to wear. Their light weight requires little headband pressure. Compactness permits full vision—safety goggles can be worn. Washable cotton FACELET* protects face.

*Trade Mark Reg. U. S. Pat. Off.

Get in touch with your WILLSON Safety Service Distributor for full information. Or write Dept. ST-6.

GOGGLES • RESPIRATORS • GAS MASKS • HELMETS

DOUBLE WILLSON
PRODUCTS INCORPORATED
READING, PA., U.S.A. Established 1870

(*Continued from page* 224)

back to the sand preparation plant. Still another system would be to transfer the poured molds by means of a short section of gravity roll conveyor to a conveyor taking the molds to a vibrating shakeout screen. Some of the advantages in the use of a central shakeout system are:

1. Cleaner castings are obtained; 2. Shakeout dust is held to a minimum because by confining the shakeout location a hood can take away dust and steam. This is not possible when shaking out over a long grating spanning the total distance of the gravity roll conveyor because of the area involved; 3. More sand recovered from the casting resulting in a decrease of the new sand additions; 4. Castings are all at central point which should be so planned to be near the cleaning and grinding room.

In a system involving a power-driven mold conveyor, molds are set on the moving mold conveyor by the molder as an empty tray passes his molding station. The molding station should be so arranged that a 90 degree turn and one step forward is all that is necessary to place the mold on the conveyor tray. The molds travel through a zone where the weights and jackets are put on and then are poured from an overhead ladle that travels along the path of the mold conveyor. The pourers either walk with the mold conveyor and pour, or they travel with the mold conveyor at the same speed by means of a pouring conveyor which is a flat top slat conveyor about 24 inches wide located beside and parallel to the mold conveyor. Note that the molds are brought to the pourer; two or three pourers easily can take care of the molds on a power mold conveyor.

After the molds are poured and cooled sufficiently the weight and jackets are taken off and placed on unpoured molds. These zones are opposite each other and about 4 feet apart so the shifter has a minimum of traveling to do. After the weights and jackets are removed the mold passes through a zone called the cooling zone. The mold conveyor is hooded at this section, and exhaust fans mounted in stacks from the cooling hood exhaust the steam, fumes and smoke into the atmosphere.

When the molds have traveled for a predetermined time through the cooling zone the mold reaches the shakeout zone and is shaken out over a vibrating screen. If snap flasks are used this may be done automatically through a tilting tray on the mold conveyor car or through an automatically timed air cylinder ejecting the mold onto the shakeout screen. Bottom boards stay on the tray and return to the molders. If tight flasks are used it is necessary to handle the flasks to the shakeout manually. Not counting the molders, from four to five men are required to pour, shift weights and jackets. If automatic shakeout is not

(*Concluded on page* 228)

MANAGEMENT COUNSEL

ALAN H. RICHARDSON
Foundry Engineer

Mr. Richardson is counselor on foundry practices, equipment, facilities and standardization of alloys for specific applications. He is a registered, licensed, professional engineer with a B. S. degree in administrative engineering from Yale University. He also studied at Rutgers University and Stevens Institute. He was formerly foundry engineer with nationally known steel companies and foundry superintendent and production manager with ferrous and non-ferrous foundries.

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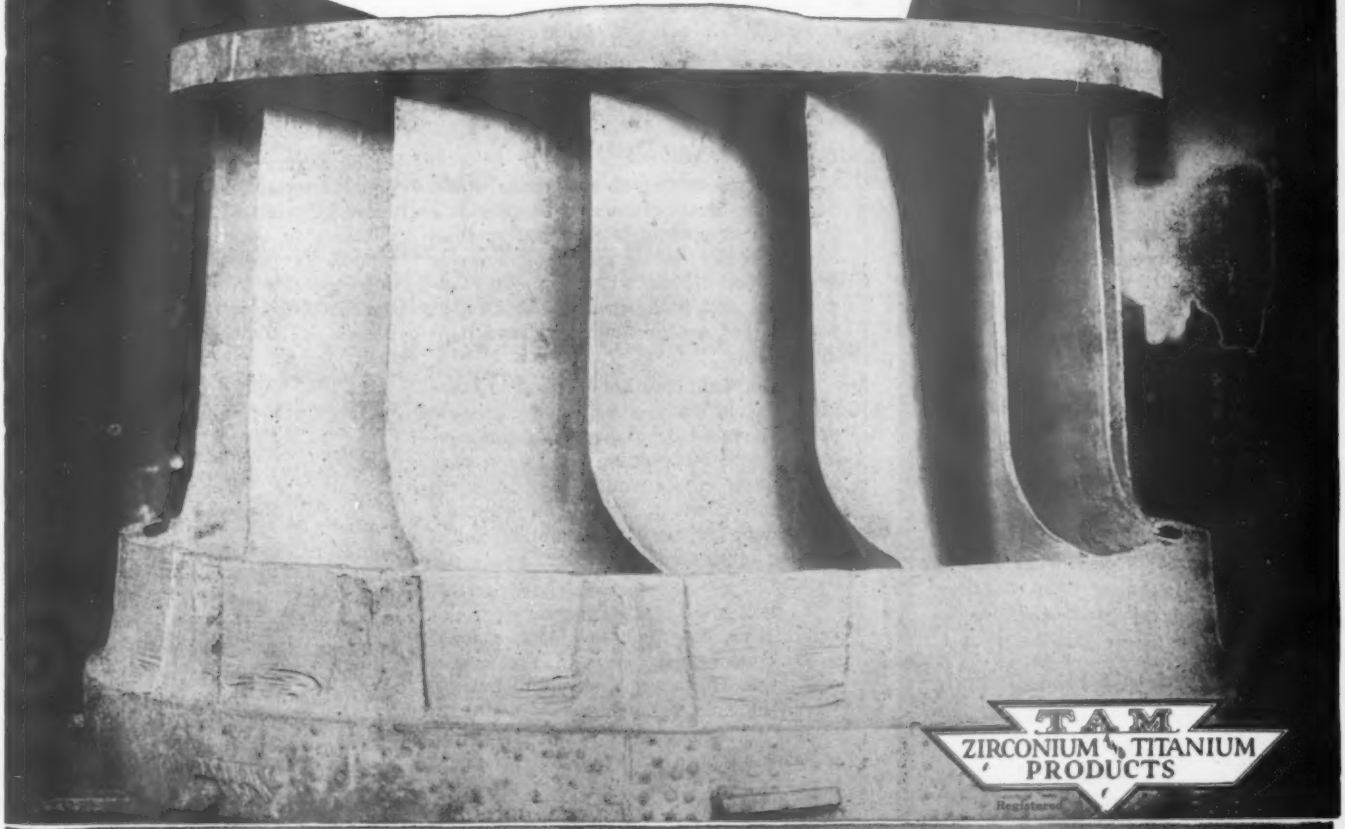
By resisting the burning-in of the molten metal, TAM Zirconite Mold and Core washes speed up output of good castings by reducing the number and time of cleaning and finishing operations. Available in three grades: Zirconite A has a melting point above 3775° F.; Zirconite B has a melting point above 3600° F.; and Zirconite C, for special uses, has a melting point above 3600° F. They are quickly mixed by adding to water, and can be applied by either spraying, swabbing or painting on cores and molds. Write for complete details, today.

TITANIUM ALLOY MANUFACTURING COMPANY

Zirconite Wash was used on this 94,000 pound .30-.35 carbon steel casting—11'6" high 14' diameter. Of special interest is the fact that no nails were used in the facing.



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AGILE Yellow
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Without Pre-heating

These electrodes have a low striking voltage. The part to be welded needs *no pre-heating* and in many cases it can be welded without dismantling the unit of which it is a part. The weld deposit has greater strength than cast iron and is easily machineable.

AGILE Black
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(*Concluded from page* 226)

used one more man will be required where snap flasks are used and two men will be needed where tight flasks are used.

On a gravity roll conveyor system, from 12 to 14 men are required to perform the same tasks. This results in a savings in labor alone of about $1.25 to $1.50 per ton melt figuring the average weight of iron in the mold to be 20 pounds.

From the foregoing, it may be seen that a power-driven mold conveyor system will produce the ultimate in molding savings, space occupied and will secure more production at a lower cost. However, such a system requires careful planning and will operate successfully only where there is continuous metal and production is such that all castings of a similar nature can be used on the line and where the order runs are long. The cooling time is fixed and all castings must be ready to be shaken out when the shakeout point is reached, otherwise they should be kept off this line. Obviously, the mold conveyor system is much less flexible than the gravity roll conveyor system and as a rule will not operate satisfactorily in a small jobbing shop but has a definite advantage in a large production foundry. Compensations can be made in a gravity roll conveyor system for unequal cooling time and various sizes and classes of castings. In case of interruptions in metal supply or shakeout, the resulting damage to production is not as severe as when a mold conveyor is used.

Develop Overall Plan

Foundries starting to mechanize would do well to develop an overall plan and to install equipment in units rather than attempt to mechanize the whole foundry in one step. This will allow for readjustments and will permit a selection of work to put on the mold and sand handling unit.

Smaller foundries not justified in complete mechanization of even a single unit can profit from a small, compact, central sand reclamation and facing sand preparation equipment. Such units are standardized and will prove an attractive investment for most small jobbing shops melting approximately 10 to 15 tons per day.

In such units a vibrating screen is located near the floor level for manual loading, a hopper beneath the screen discharges to a bucket-type elevator, which elevates the screened sand to an overhead hopper or bin, fitted with a gate for discharge to a muller type mixer. The mixer, in turn, discharges, after proper blending, into an aerator that throws the sand, at the same time aerating and fluffing it, into a box, wheelbarrow or onto the floor, from where it is transported to the molders. The sand to be prepared by this unit is collected alternately from the different floor heaps as they become weak and contaminated from re-use.

Such a unit will justify the investment, and will bring about savings by reclaiming refuse sand, thus reducing sand costs; by reduction of scrap through better preparation of the molding sand; by improvement in quality of castings; by reduction of cleaning room costs; and by molders increasing production as the preparation of the sand heap is improved.

Note that the essentials of this unit are: Screen, elevator, storage hopper or bin, muller type mixer, and aerator. The approximate cost of such equipment, erected, ready to run, assuming that the building space is available, will range between $7000 and $10,000 installed.

The arrangement described may be elaborated on by the addition of a magnetic belt conveyor to remove metallic scrap and shot iron, etc. This addition would increase the cost by $1500 to $2000. The same unit can be elaborated on with the addition of an elevator and prepared-sand bin, further increasing the cost approximately $4000 to $6000.

Still another compact portable unit, consists of a hopper, feeder, vibrating screen and Royer sand conditioner. This unit costs about $5000 and can be picked up with a crane and set wherever desired.

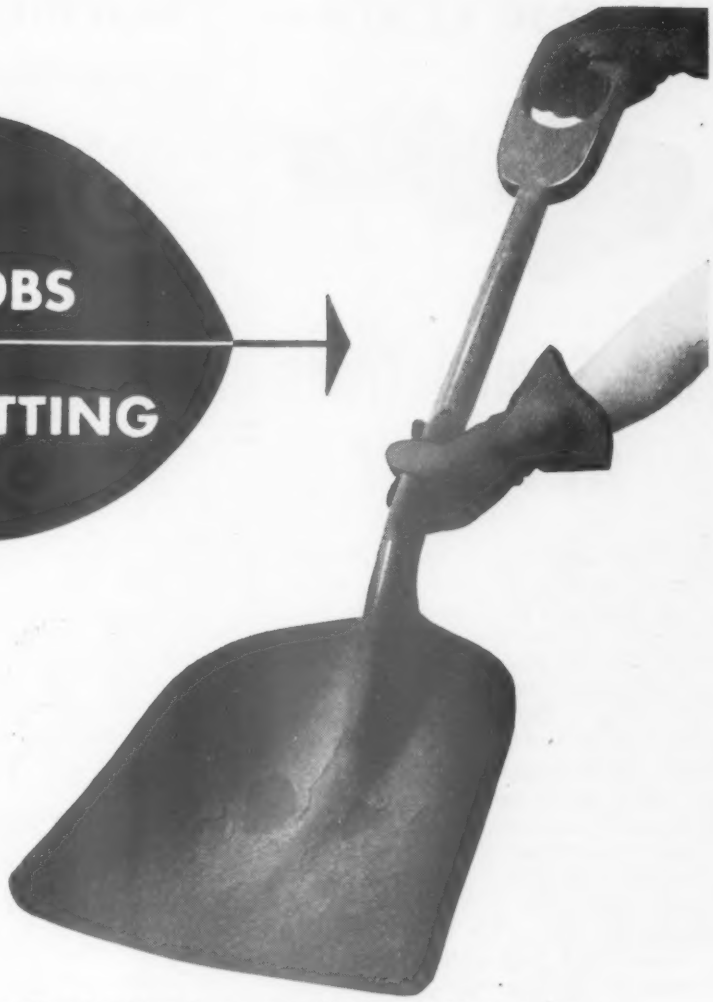
Discuss Engineering Materials

What has been done with light metals, including low alloy high strength steels and austenitic group of stainless, for increased application in strong, light weight construction, was reviewed at panel meetings, sponsored by the Engineering Societies Committee on War Production, in New York, Jan. 30. Attended by several hundred engineers, developments in steels and lighter nonferrous alloys were discussed, with emphasis on their postwar utilization in many fields.

Noting the general improvement in dimensional accuracy of the product, Donald J. Reese, chief, manufacture and foundry products section, metallurgical and conservation branch, steel division, WPB, stressed the great range in tensile strength of gray iron castings, indicating engineers are not always appreciative of this range for many applications. Mr. Reese said the foundry industry's importance in war had been recognized late, but that it had processed about 23 million tons of metal in gray iron, steel and malleable shops last year. Roughly, product tons by foundries last year were: Gray iron, 10,000,000; steel, 2,450,000; malleable, 900,000; aluminum, 258,000, and magnesium, 39,000, exclusive of incendiary bombs.

Aluminum Division, Reynolds Metals Co., Louisville, Ky., is distributing a metals weight calculator in slide rule form with which the weights of strip, plate, rectangles, rods, bars, wire, tubing and circles may be determined for aluminum, magnesium, copper, nickel, brass and steel.

O.K. FOR SOME JOBS
NOT FOR SANDCUTTING



As a piece of foundry equipment for cutting sand the shovel is out-moded. Today when human labor is so vital, every foundry should eliminate the high cost and drudgery of cutting sand by hand.

Shoveling, always a slow and costly operation, is eliminated with a Sandcutter—and you get real, lowcost sand conditioning with these extra advantages:

The condition of sand cut with a Sandcutter is unexcelled, for it can be prepared in accordance with individual requirements for moisture, bond and permeability. It riddles fast, rams easily and vents perfectly.

The action of the Sandcutter in mixing sand and water is most thorough. Every particle is cut and re-cut. All lumps are broken up and moisture and bond are thoroughly distributed.

The sand is thoroughly mixed, aerated and cooled as it is thrown backward into the air and tossed from side to side.

The Sandcutter piles sand beside the molding machine or between benches and is the most simple and speedy method of sand cutting because it goes to the molding floors, the sand does not have to be carried to it.

Stop shoveling away your dollars and your labor. Send for literature today on the American Line of Sandcutters.

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Coast Metals Hard-Facing makes possible fewer equipment shutdowns, less idle labor, conservation of critical metals, salvage of worn parts and maximum equipment output. Not only for foundry hammers, but also for hot shear blades, slag buckets, tong grips, mill guides, and innumerable other products, machines and equipment!

Coast Metals can be welded either by the electric arc or the acetylene torch to all ferrous metals, including manganese steel, alloy steel, cast iron and chilled iron. New booklet, "Your Best Protection Against Wear" *free* on request. Write for your copy *today.*

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hard-facing weld rods
MAKE YOUR
EQUIPMENT
LAST LONGER

INJURIES AND ACCIDENT CAUSES

(*Continued from page* 95)

programs, which are more difficult to maintain in an independent and smaller establishment.

In job foundries, on the other hand, the items produced are continually changing. Frequently only one casting will be made in a particular design. Consequently, standardization of the operations is impossible and the workers must be trained as craftsmen capable of undertaking a wide variety of operations rather than as specialists. The possibilities of mechanization are limited and a very large part of the work must be performed manually by procedures worked out on the spot as the occasion arises. This condition necessitates the employment of skilled journeymen who have had training in all branches of foundry work and are capable of handling each job through every stage of production.

In the smaller job foundries it is common procedure for a single journeyman to perform or direct all operations involved in making a particular casting or set of castings. In the larger job foundries some degree of specialization is possible, and the journeymen are assigned to phases of the work such as pattern-making, coremaking, molding, or crane operating. Competent journeymen generally have served a formal 4-year apprenticeship. Much of the work in job foundries, however, is performed by laborers or helpers, who have been given little training and who work under direct supervision of journeymen.

Favorable Plant Records

Although the group averages present a relatively unfavorable picture of safety achievement in the foundry industry, the individual plant records indicate that safety is not an impossible goal in any foundry. Over 24 per cent of the ferrous job foundries, 63 per cent of the nonferrous job foundries, and 29 per cent of the non-job foundries had no disabling injuries in 1942. It is true that most of the plants which had zero frequency rates were small, but among them were a number of plants which regularly employed more than 250 workers each. An additional 10 per cent of the ferrous job foundries, 6 per cent of the nonferrous job foundries, and 14 per cent of the non-job foundries had frequency rates which were lower than the 1942 national average of 19.9 for all manufacturing.

In sharp contrast, a considerable number of plants in each of the groups had frequency rates of over 100. Most of these plants were also small, but there were some plants which employed over 500 workers in this extremely high rate group. Generally speaking, very small foundries with fewer than 24 employes and large foundries employing 500 or more employes had the lowest average frequency rates, but the distribution of frequency rates within the various size groups conclusively indicated that size of plant need not be a controlling factor in safety. Plant size, in one way or another, may either facilitate or impede the functioning of a safety program, but it seems evident that, regardless of size, those plants which take a genuine interest in safety do have lower injury frequency rates than those which make only perfunctory efforts towards safety.

Plant size becomes a factor in the advancement of safety in many ways. In small shops the supervisor, who is frequently the owner with a personal financial interest in keeping the accident volume at a minimum, generally is able to keep all operation under observation. He can see unsafe conditions and practices as they develop and can take immediate precautions to eliminate incipient hazards.

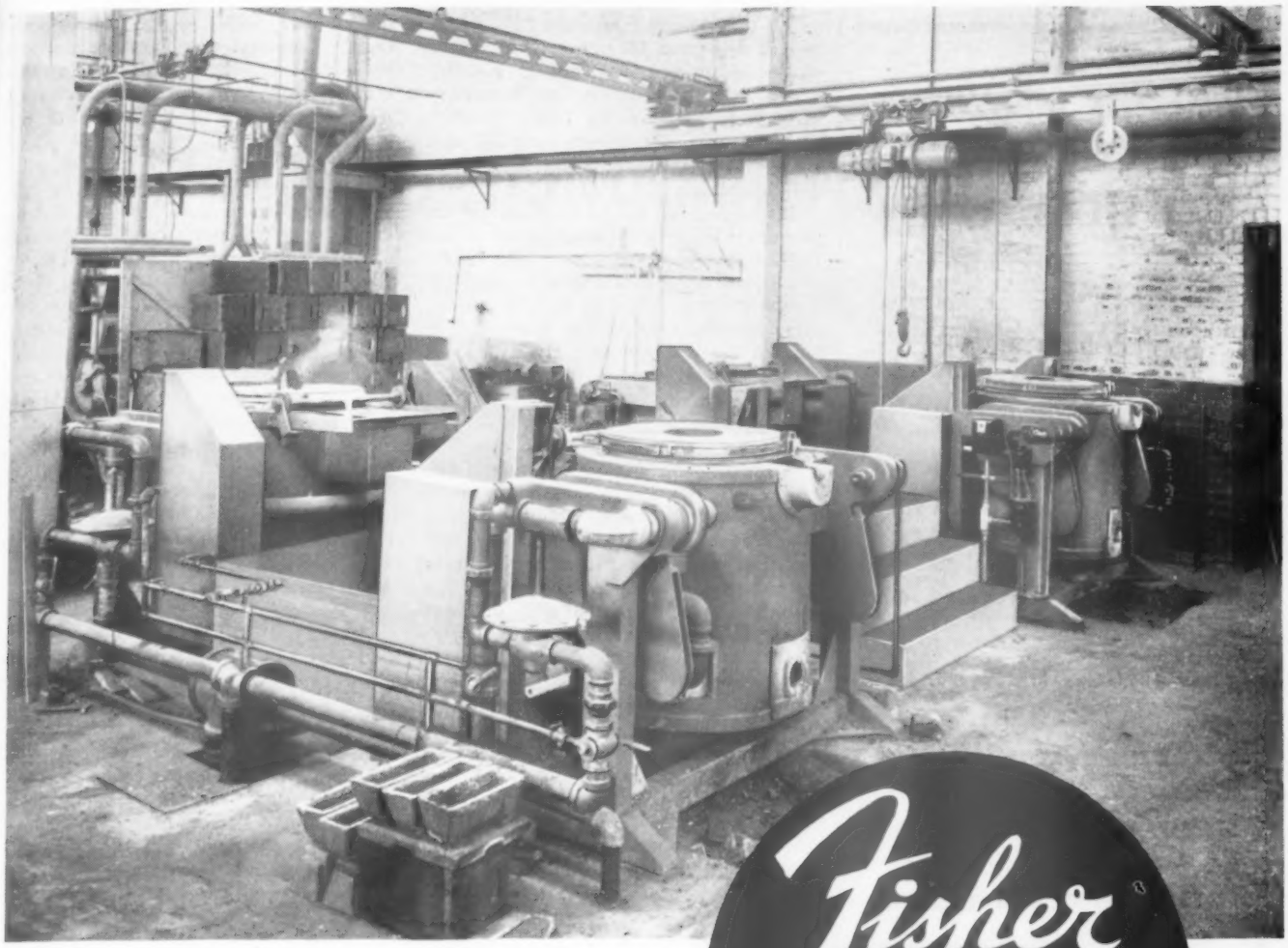
Special Attention To Safety

In very large shops the volume of production generally makes it possible to give special attention to safety. Plants with 500 or more employes usually can afford to employ a safety engineer to carry on a scientific accident prevention program, and can afford to provide all guards and safety equipment known to be available. Large plants also can generally maintain some form of medical or trained first-aid service upon the premises. They also have the advantage of professionally engineered plant lay-out and work processes, and are generally in a position to utilize mechanical equipment more extensively than are the smaller plants. This is of particular importance in connection with material handling operations in which the provision of mechanical conveyors, hoists, cranes, and power trucks can do much to avoid many of the injuries associated with the manual performance of such operations.

In medium-size foundries the problem of safety is complicated by the fact that the responsible head of the plant seldom can devote much of his time to observing shop operations and, therefore, must delegate much of the responsibility for safety to others. Unfortunately, few such plants can afford to employ a safety specialist and as a result the responsibility for safety must be vested entirely in foremen or supervisors, who seldom have had safety training and who frequently feel that their production responsibilities are of much greater importance than attention to safety.

Because of the varying numbers of plants reporting in the different foundry categories it was impossible to establish a uniform size breakdown for each of the groups. It is interesting to note, however, that among the gray iron, malleable iron, and steel job foundries the highest average frequency rates were those of the plants which had between 150 and 249 employes. In the gray iron foundry group the lowest average was that of the very small plants which em-

(*Continued on page* 232)



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(*Continued from page* 230)

ployed less than 10 workers but in the malleable iron and steel job foundry groups the lowest average frequency rates were those of the larger plants—malleable iron plants with over 500 employes and steel foundries with over 1000 employes.

In the nonferrous foundry group the plants with 75 to 99 employes had the highest average frequency rate while those with 10 to 24 employes had the lowest average. Among the other-than-job foundries the lowest average was that of the plants with 500 to 999 employes and the highest was that of the plants with 50 to 74 employes.

In most industries it is not at all unusual for individual plants to complete 1,000,000 or more employe-hours of operation without a single disabling injury, which is approximately equivalent to a year's operations in a plant having 500 full-time employes. It is pertinent to note, however, that not one of the 114 foundries which reported 500 or more employes had an accident-free record in 1942, although one cast iron pipe foundry reported only one injury in 1,917,552 employe-hours worked, a frequency rate of 0.5 for the year. This was the lowest rate achieved by any of the plants with 500 or more employes. In direct contrast, one of the malleable iron job foundries with 591 employes and 1,376,216 employe-hours worked during the year, reported 198 injuries, which gave it a frequency rate of 143.9.

Points To Hazardous Departments

In both types of job foundries and in non-job foundries the most hazardous departments were shakeout, melting, and cleaning, chipping, and finishing, as shown in the accompanying table. The record of the molding departments was about average in each group. Pattern shops and core rooms had the lowest injury-frequency rates among the principal operating departments.

In addition to providing summary reports, which were included in the general study of injury-frequency rates, 66 of the ferrous job foundries also supplied details concerning each of their reported accidents. The 4600 cases reported were analyzed according to the "American Recommended Practice for Compiling Industrial Accident Causes" as approved by the American Standards Association. Strictly speaking, the conclusions drawn from this analysis apply only to gray iron, malleable iron, and steel job foundries, as no other types of foundries participated in this part of the study. In general, however, it appears safe to say that the experience of these three types of job foundries is fairly representative of all ferrous foundries and, to a somewhat less extent, may be considered as similar to that of the nonferrous foundries.

A bureau agent visited each of these foundries, and, insofar as possible, transcribed from their records the following items regarding each injury: Age, race, and experience of each person injured; place where the accident occurred and time it occurred; nature and extent of the resulting injury; type of accident; unsafe condition and unsafe act which led to the accident; and the object or substance (agency) which caused the injury. A brief record was also made of the safety activities of the different plants and of the first-aid or medical facilities provided on the premises.

In some instances all of the desired details were not available. For this reason, the number of cases analyzed in respect to particular accident factors varies considerably. However, all parts of the analysis are based upon the records of at least 58 foundries. Thirty-one of the foundries visited were gray iron or cast iron pipe foundries; 24 were malleable iron foundries, and 11 were steel foundries. The entire group employed approximately 40,000 workers and their records included the details relating to over 4600 disabling injuries. The plants were located in 22 states, providing a cross section representing all regions except the Mountain Region.

Feet Injuries Lead

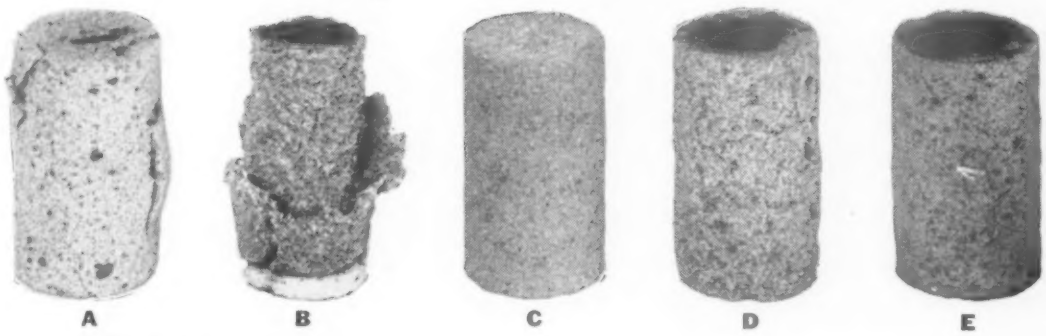
The detailed analysis indicated that 26 per cent of the disabling foundry injuries were foot and toe cases, 23 per cent were hand and finger injuries, 10 per cent were eye injuries, 12 per cent were back injuries, and 10 per cent were other trunk injuries. The greater part of the injuries to toes, feet, hands, and fingers consisted of cuts, sprains, bruises, or fractures resulting from mishandling of heavy materials. Most of the eye injuries were cuts or lacerations inflicted by flying particles, and nearly all of the back injuries were strains or sprains resulting from lifting excessive weights or lifting improperly. Burns were quite numerous and affected all parts of the body. Poor housekeeping and the lack of proper personal safety equipment for use in hazardous operations were the outstanding unsafe working conditions which led to the injuries. On the personnel side the outstanding unsafe acts which contributed to the occurrence of injuries were: Using unsafe equipment or using equipment improperly; assuming an unsafe position or posture; failing to wear safe clothing or provided safety equipment; and unsafe lifting.

Although most of the hazards encountered in foundry work are directly connected with particular operations and, therefore, are of primary concern to the workers engaged in those specific operations, there are certain hazards which in some degree must be faced by all foundry workers regardless of their assignments.

Practically all workers in foundries at times must move, or assist in moving, heavy materials and thereby are exposed to the possibilities of sprains, or crushed fingers or toes. Nearly all workers on the foundry floor at times must work in proximity to pouring operations and thereby are exposed to injury from spilled or splashed molten metal. The movement of heavy materials is frequently accomplished by means of overhead cranes which may swing their loads over the

(*Continued on page* 234)

How does your sand behave?

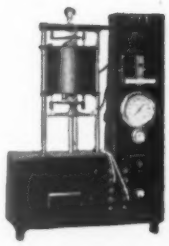


SAND SPECIMENS A and B will produce rat tails and scabs as shown on casting F. Specimen C is free from defect. Specimen D has been improved by addition of cereal binder. Speciman E, with clay bond added, is free from buckling.

MOISTURE TELLER

THE SCARCITY of materials and manpower makes high scrap losses very unprofitable. With little effort and a surprisingly small investment, a simple, practical sand control program can be instituted in the small or large foundry. By controlling the fundamental physical properties of molding sand, such as moisture, permeability and strength, the number of castings scrapped daily can be quickly reduced.

Institute a complete sand control program and make your plant a better war production unit. Write to us, describing your available sand preparing equipment, type and size of castings, tonnage and type of metal. We will be glad to give you our recommendations as to a suitable sand control program.



HITEMP DILATOMETER

MOLD HARDNESS TESTER

RAPID SAND WASHER

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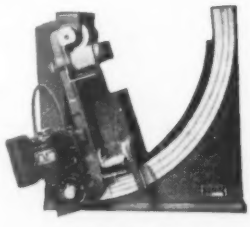

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CONTROL EQUIPMENT SAVES TIME

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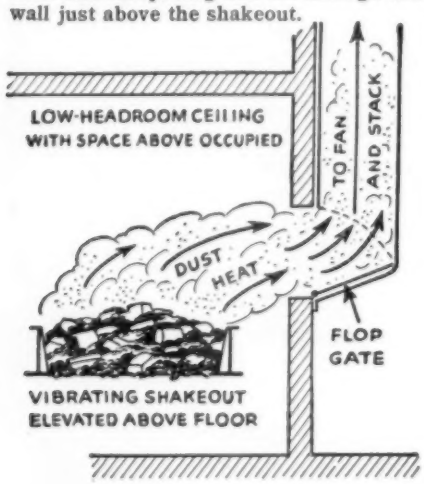
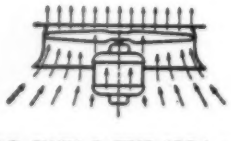
Would you put a shakeout in a narrow, low-ceiling passageway between sand bins and the main foundry bay? *Probably not.* But with space at such a premium, today, it has been done. And a Propellair fan keeps the area *cool* and *clean.*

There wasn't headroom for a hood, nor could fumes and dust be drawn upward because the space above was occupied. But a duct could be installed beyond the partition wall on the foundry side. So it was. And an opening was cut through this wall just above the shakeout.



Anything was worth a try because something had to be done, but the Plant Engineer was more pleased than surprised at the effectiveness of his brain child. He knew from experience that a Propellair fan in the exhaust stack would draw a lot of air. It does—and thanks to installation ingenuity and Propellair efficiency, the attendant now works in *comfort the year around.*

Send for Catalog No. 10F. Learn how Propellair fans can help you solve your problems. There are types and sizes for every foundry need. Fourteen years of propeller-fan specialization, and sales engineers in 25 cities, are at your service.



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"MOVING AIR IS OUR BUSINESS"

PROPELLAIR
INC.
SPRINGFIELD · OHIO

(*Continued from page* 232)

heads of workers who are unaware of the imminent possibility of materials falling upon them. Improperly piled materials present dangers to any workers who approach them. Many parts of foundries are always quite warm while other sections may be cool or even cold, presenting the possibility of chills to all workers who must move around the plant.

The hazard of contracting silicosis from the silica dust dispersed in molding and cleaning operations may also affect all workers on the foundry floor regardless of their occupations. It should be noted, however, that relatively few cases of this industrial disease were reported in the survey. As this low volume of silicosis cases is contrary to the viewpoint frequently expressed by commentators upon foundry hazards, particular care was taken to insure that no cases of record in the plants visited were omitted. It is possible, of course, that because of its gradual onset and the similarity of its symptoms to those of other non-industrial diseases some cases of silicosis may go unrecognized. Nevertheless, there were no grounds for doubting the completeness of the records of these cases, as silicosis usually is a compensable disease, and all cases which had been so diagnosed would of necessity be formally recorded and reported to the state workmen's compensation commissions.

Operate in Five Departments

The departmental organization in the foundries which participated in the survey varied widely from none at all in the small plants to as many as 20 departments in the larger plants. For this reason there were many differences in the number of units and in the operations and occupations included in the various departmental groups. This was particularly true of operations performed by unskilled and semi-skilled workers. Generally speaking, foundry operations naturally break down into five related but distinct procedures which form the basis for the departmentalization usually found. These most commonly reported departments were: Pattern shops; core rooms; molding departments; melting departments; and cleaning, chipping and finishing departments. Other departments frequently reported separately included maintenance, shipping, storage, and shakeout departments of the various plants investigated.

Pattern shops—Much of the work of making wood patterns requires very close fittings and finishing in which hand tools, such as chisels, gages, knives, spokeshaves, saws, planes, drills, hammers, screw drivers, try squares, and measuring devices are used. Many of these tools have sharp cutting edges and when mishandled can inflict severe wounds. However, the most serious hazards are encountered in the operation of power driven woodworking machines, such as saws, lathes, planers, boring machines, jointers, and sanders. Generally speaking, the greatest danger involved in the use of these machines is that the operator may bring his hand into contact with the cutting parts as he feeds the stock at the point of operation, although there are various types of guards for these machines which make it nearly impossible for such accidents to occur when they are properly applied and used.

Common practice in making metal patterns is to construct a wooden pattern first and from this cast the metal pattern, but in many instances the practice is to cut metal patterns from solid metal blocks. When this procedure is followed the pattern shop takes on all of the characteristics of a machine shop, and most of the work is performed upon metalworking machines such as milling machines, shapers, planers, drill presses, engine lathes, grinders, and power driven hacksaws. Each of these machines presents some "point of operation" hazard to the fingers and hands of the operators. The heavier materials used in metal pattern shops also present a crushing hazard to fingers or toes if they are mishandled or dropped.

Pattern Shop Rate Low

In comparison with the experience of the other major operating departments the accident frequency rates of the pattern shops were relatively low. In the ferrous job foundries the wood pattern shops had an average frequency rate of 21.2 disabling injuries per million employe hours worked, while the metal pattern shops had an average rate of 29.8. In the non-job foundries the rates were lower, but the relationship was reversed, the wood shop average being 15.0 compared with an average of 7.4 in the metal shop. In the nonferrous foundries the average frequency rate for pattern shops was 20.9. It is pertinent to note that 1 in every 9 of the injuries reported in wood pattern shops resulted in some form of permanent impairment.

Finger injuries were more numerous in the pattern shops than were injuries to any other part of the body, with foot and toe injuries constituting the second most important group. The frequency of finger injuries in these departments reflects the use of power tools, particularly powered woodworking tools, and points to a need for greater emphasis upon the proper guarding of such equipment. The relatively high proportion of foot and toe injuries is somewhat surprising, and indicates that the desirability of more general use of safety shoes should not be overlooked in this department.

Core rooms—A variety of hand tools, such as mallets, trowels, shovels, pliers, core boxes, clamps, core plates, and compressed-air blowers for cleaning, are used in core rooms. Various machines and other mechanical equipment, such as sand mixers, conveyors, wheelbarrows, baking ovens, and molding machines, also are commonly used. The hand tools are not particularly hazardous, but the machines frequently may present serious possibilities of injury to hands and arms from contact with moving parts. Burns from contact with hot ovens or oven trays are common.

Generally, coremaking is not consid-

(*Concluded on page* 236)

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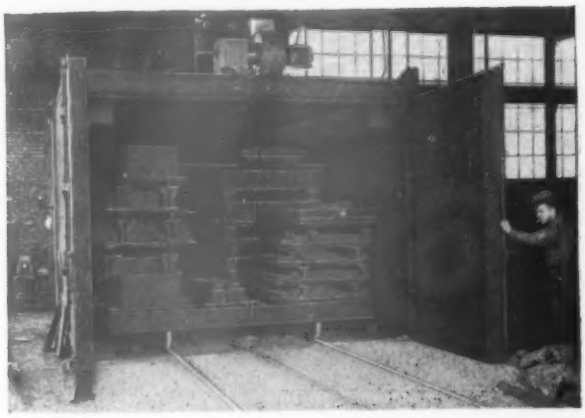
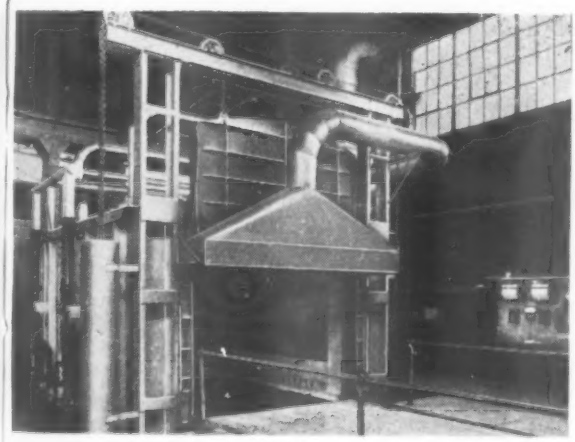
Metal Melting

Rockwell tilting type, crucible melting furnace for non-ferrous metals; oil or gas fired. Also built in stationary crucible and pot types, and reverberatory melting furnaces.



Core Baking or Mold Drying

A typical Gehnrich oil fired, recirculating convection heated oven, that assures uniform baking of heavy mass. Gehnrich foundry ovens are built to exact requirements from the smallest shelf or drawer type oven to large continuous conveyor or tower ovens.



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Rockwell car hearth furnace for annealing castings; one of many types of batch or continuous conveyor, oil, gas or electric furnaces for any metal heat treating process.

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(*Concluded from page 234*)

ered very heavy work. The metal core boxes and core plates, however, sometimes are fairly heavy and present lifting hazards and the possibility of pinched or crushed fingers or toes if they are mishandled or dropped.

The frequency of injuries reported for the core rooms was somewhat greater than that of the pattern shops, but was less than that of any of the other major departments. In the ferrous job foundries the core rooms had an average of 30.9 disabling injuries for each million employe hours worked. In the nonferrous job foundries the average frequency rate for core room work was 12.7, and in the non-job foundries is was 18.6.

Injuries to hands, fingers, feet, toes and backs were outstanding among the reported injuries to core room workers. Injuries in these categories are all closely related to the use of hazardous machines or to the handling of heavy, bulky, or awkward materials, and indicate a need for better machine guarding and for careful planning and training of the workers in the operations they must perform. The volume of foot and toe injuries also indicates that the use of safety shoes or foot guards might well be emphasized in the core rooms.

Molding departments—The first step in making a mold is to prepare the sand by mixing it with binder materials. This is frequently done by hand mixing with a shovel, but in the larger foundries sand mixing machines or mullers are commonly used. In either case the work is comparatively heavy as the sand usually must be moved several times in the course of the operation. Aside from the hazard of overlifting, the chief danger in mixing the molding sand is that of coming into contact with the moving parts of the mixing machines.

The principal hazards connected with hand molding are those arising from lifting and moving the flasks, which frequently are very heavy. The same hazards prevail in machine molding with the added danger of contact with the moving parts of the machines.

The greatest hazard in pouring operations is that of severe burns from contact with the molten metal, which may splash or spill as it is being carried or poured, or may overflow if the mold is poured too full, or may even break out of the mold if the mold is not properly vented so as to permit the escape of gases. It is recognized as essential, therefore, that workers engaged in pouring operations should wear goggles and insulated clothing, particularly leggings, gloves and molders type safety shoes, which can be pulled off instantly in case molten metal should get inside them.

It is also important to maintain good housekeeping in the pouring area to avoid the possibility of bumping the ladle against improperly placed materials and to eliminate tripping hazards which might cause the ladle carriers to spill the metal. Only workers who are participating in the pouring should be permitted to be within the range of a possible spill, and all steps in the pouring should be under close supervision.

Removal of the casting from the mold after the metal has solidified and cooled sufficiently to be handled, is commonly a function of the molding department although it is not unusual for this work to be assigned to a general labor department or even to be constituted as a separate department in large foundries. In this operation jolting machines sometimes are used to loosen the sand, but usually the only equipment employed consists of sledges, mallets, bars, shovels, wedges, wheelbarrows or hand trucks, and, when the castings are large, hoists or cranes. The principal hazards are those involved in handling heavy, rough, and sharp edged materials. Safety shoes and gloves are generally considered to be essential equipment in this operation.

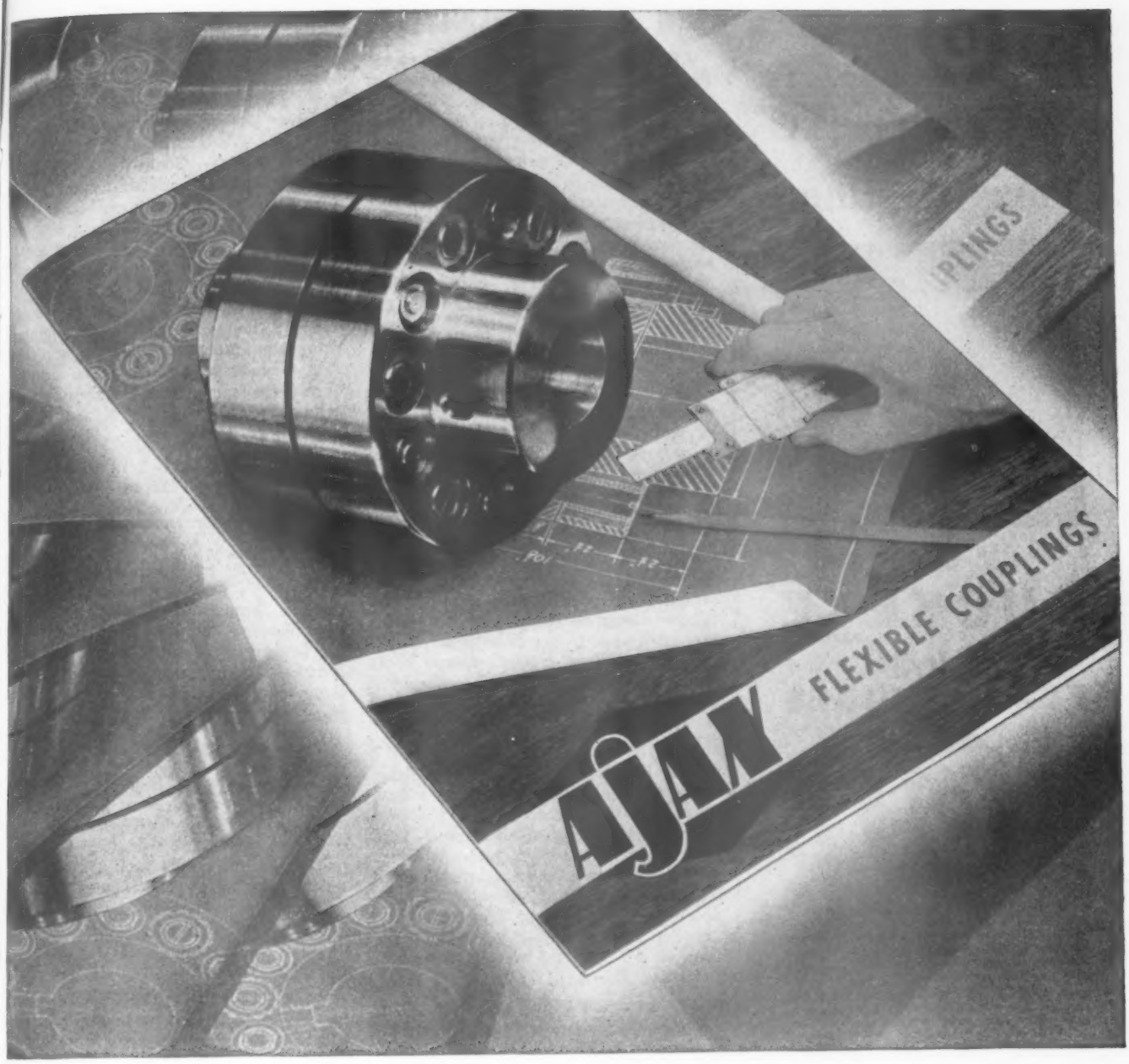
Since in terms of total employment the molding departments constitute the largest of the foundry operating sections, their experience has a great influence on the overall average frequency rate for foundry operations. This is apparent from the fact that in all three of the foundry groups the average frequency rates for the molding departments closely approximated the average rates for all operations. Nevertheless, the average frequency rates for the molding departments are considerably higher than the averages prevailing in most other industries and approach the level which is generally considered quite high.

Shakeout Department Highest

In the ferrous job foundry group the average for the molding departments was 59.7 disabling injuries per million employe-hours worked. In the nonferrous job foundries the molding department average was 34.2 and in the non-job group it was 43.0. In some of the ferrous job foundries and in some non-job foundries it was possible to report shakeout work separately. The resulting frequency rates for this particular operation strikingly emphasize its extreme hazards. In the ferrous job foundries shakeout work had an average of 110.3 disabling injuries per million employe-hours worked and in the non-job foundries it had a comparable average rate of 85.9. Each of these was the highest rate recorded for any operation in its group.

The high proportion of injuries to the lower extremities reported for the molding departments points to a need for greater emphasis upon the use of foot-guards, safety shoes, and leggings. Similarly, the large volume of hand and finger injuries indicates a need for more general use of gloves and for better training in the safe procedures in handling materials. Back injuries were very common, a situation which points to a need for more instruction in the proper methods of lifting and closer supervision to see that the proper methods are used. Eye injuries were also quite numerous, indicating that more extensive use of goggles would be highly desirable. Lack of co-operation on the part of employes causes many accidents.

(*To be continued next issue*)



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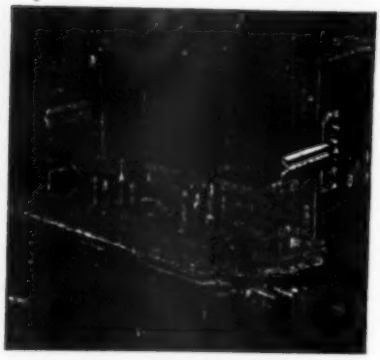

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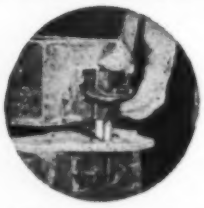

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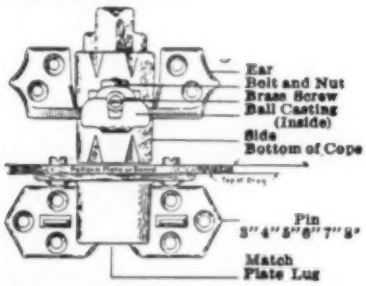

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NEW TRADE PUBLICATIONS

COUPLINGS — Ajax Flexible Coupling Co. Inc., Westfield, N. Y., has issued a new 24-page catalog, No. 44, which describes many of the important applications of flexible couplings on direct-driven generators, compressors, winches, and other mobile and stationary equipment. Distinctive parts, horse power ratings, service factors, bore and keyway specifications for light, medium, and heavy duty couplings are shown, as well as types for mill motor, shear pin, bolt on, brake drum and detachable hub use.

SPARK SUPPRESSOR — Bulletin FY-133, issued by the Whiting Corp., Harvey, Ill., describes the application, advantages, construction and operation of that company's Hydro-Clone cupola spark suppressor, which provides a practical, low-cost method of eliminating danger from falling sparks, flames and smoke, and of keeping roofs free from fly ash, cinders and coke breeze.

MATERIAL HANDLING — Lewis-Shepard Co., Watertown 72, Mass., has published a new 76-page catalog, No. 22, containing illustrations of lift trucks, skid platforms, power fork trucks, stackers, cranes, floor trucks, storage racks and a large selection of specially built equipment for unusual jobs in production, process and in storage.

BAND SAWS — Tannewitz Works, Grand Rapids 4, Mich., has available a 32-page booklet entitled "Friction Sawing," describing the use of frictional heat in the cutting of sheet steel, nonferrous metals, armor plate, soft or hardened steels, plastics, glass and other materials. Band saws of standard high-speed, variable speed, for inside and outside sawing, filing and polishing, large model saws and for special applications are illustrated.

ALLOY STEELS—American Steel Castings Co., Newark 1, N. J., offers a bulletin containing chemical analyses, physical properties and applications of popular corrosion and heat-resisting alloy steels adaptable for valves and pump castings, furnace parts, etc.

OIL BURNERS—A new bulletin, No. 802, has been prepared by Peabody Engineering Corp., New York 19, which describes the mechanical and operating features of oil burners for natural or forced draft operation and for use with mechanical, wide range mechanical or steam atomizers.

STEEL STAMPS—Bulletin No. 106, a three-color folder recently published by Acromark Co., 327 Morrell St., Elizabeth, N. J., gives complete data and prices of steel letter and figure stamps developed for use in industrial plants producing heavy and light precision machine products, for marking forged steel cylinders, rails, billets, ingots, castings, stainless steel, monel, etc.

BLOWERS, PUMPS—A new 4-page bulletin, No. G-81-D, recently issued by Roots-Connersville Blower Corp., Connersville, Ind., gives essential data on rotary positive blowers and gas pumps, centrifugal blowers and exhausters, vacuum and liquid pumps, displacement gas and liquid meters, and inert gas generators. Typical installation views are shown and ranges of capacity are indicated.

HANGERS — Complete specifications for a new and recently developed line of 3-way, 4-wire, 4-pole disconnecting, lowering hangers are included in a new 20-page supplement No. 44a to catalog No. 41 offered by Thompson Electric Co., Cleveland 14. Designed for use with high-positioned combination twin or triple unit mercury and/or incandescent lighting equipment or where color lighting or various degrees of illumination are required, the hangers enable floor or ground level washing, relamping of and repairs to lighting fixtures.

HEAT TREATING BATHS——A. F. Holden Co., New Haven 8, Conn., offers a 32-page bulletin, No. 120, describing in detail the advantages, operation, temperatures, and equipment used in its neutral baths for hardening and tempering. Technical information as to physical properties obtainable through quenching procedures, recommendations for brazing, schematic arrangement of furnaces for high-speed hardening and tempering, and demetalizing unit are furnished.

FIRE BRICK—A new 8-page booklet, No. I 196-744, recently issued by Armstrong Cork Co., Building Materials Division, Lancaster, Pa., describes five types of insulating fire brick for temperatures up to 2600 degrees F. Information on suspended arches and walls, tailor-made arches and domes, thermal conductivity standards, diatomaceous earth and insulating concrete, as well as ingot mold insulation, is contained in the booklet.

TEMPERATURE CONTROL—Catalog N-00A(2), offered by Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, describes a temperature control system for the efficient operation of electrically-heated furnaces, ovens, baths or other units. Schematic illustrations show how control action is obtained by regulating the proportion of time during which current is on and off.

HEAT RESISTING CASTINGS—Meehanite Research Institute of America Inc., New Rochelle, N. Y., has issued a 4-page bulletin, No. 21, illustrating typical applications of various special heat resisting Meehanite castings, and tabulates various property data.

PROTECTIVE COATINGS—Quigley Co. Inc., New York 17, has issued five new bulletins describing an entire line of paints, enamels, aluminum and marine coatings for the protection and decoration of iron, steel, wood, brick and concrete surfaces. Catalog and color card are included.

ROTARY CUTTERS — A four-page folder, offered by M. A. Ford Mfg. Co. Inc., Davenport, Iowa, describes a complete line of carbide rotary cutters ground for precision performance.